PHYSICS ABSTRACTS

BEING

SCIENCE ABSTRACTS—SECTION A

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ABSTRACTS 2502-2747

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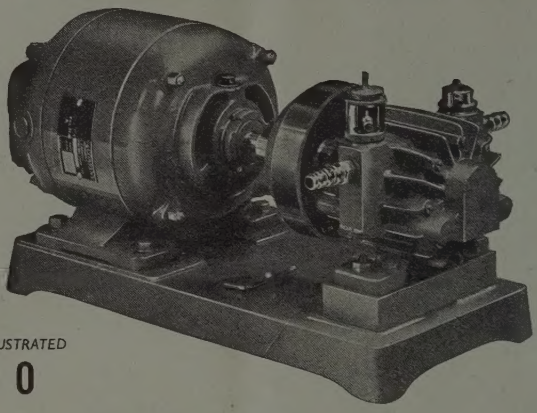

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MATHEMATICS

See Abstr. 2522 511.283 : 519.213

2502 511.31

Prime divisors and almost periodicity. WINTNER, A. *J. Math. Phys.*, 21, *pp.* 52–56, *March*, 1942.

2503 511.6 = 6

The *p*-numbers and topology. SAGASTUME BERRA, A. E. *Publ. Fac. Cienc. Fis.-Mat. La Plata*, 2, 2, *pp.* 125–145, 1941.—The *p*-numbers of Hersch are considered from the point of view of topology.

2504 512.831

A short method for evaluating determinants and solving systems of linear equations with real or complex coefficients. CROUT, P. D. *Trans. Amer. Inst. Elect. Engrs*, 60, *pp.* 1235–1241, 1941.—The cases considered are: Arbitrary systems with real coefficients (stresses in structures, transient problems); symmetrical systems with real coefficients (d.c. networks, undamped vibration, deflections in structures); symmetrical systems with complex coefficients (a.c. networks, forced vibration with dissipation); arbitrary systems with complex coefficients; systems involving 2 sets of variables (electric field problems).

2505 512.831 : 621.3.025.3

Linear transformations in three-phase circuits. PIPES, L. A. *Trans. Amer. Inst. Elect. Engrs*, 60, *pp.* 351–356; *Disc.*, 619–621, 1941.—[Abstr. 1307 B (1942)].

See Abstr. 2550 512.831 : 621.824 : 534.13.013

2506 513.573 : 526.2

The distance between two widely separated points on the surface of the earth. LAMBERT, W. D. *J. Wash. Acad. Sci.*, 32, *pp.* 125–130, *May* 15, 1942.—The author discusses the problem of finding the line of min. length between 2 points on a slightly flattened ellipsoid. The results are stated and illustrated but proofs are deferred. Special attention is given to the problem when the points are nearly antipodal.

A. HU.

2507 513.811

The space relation among five points in elliptic and hyperbolic geometry. SILBERSTEIN, L. *Phil. Mag.*, 33, *pp.* 536–540, *July*, 1942.

2508 513.82

Frenet formulae for curves in unitary space. COBURN, N. *J. Math. Phys.*, 21, *pp.* 10–18, *March*, 1942.—A set of Frenet formulae for any curve whose equations are functions of a real parameter and which lies embedded in a unitary space of n dimensions is developed. The paper concludes with a study of geodesic X_1 in a unitary K_n with semi-symmetric connection.

See Abstr. 2509 513.882 : 517.948 : 517.432

2509 517.432 : 513.882 : 517.948 = 6

On linear operators in Hilbert space. DURAÑONA Y VEDIA, A. *Publ. Fac. Cienc. Fis.-Mat. La Plata*, 2, 2, *pp.* 87–123, 1941.—The theory of continuous self-adjunct operators in Hilbert space is developed, leading to the representation by Stieltjes' integral. The theory of non-symmetrical integral equations is extended to cover linear continuous operators, and an attempt is made to extend the theory of operators to a more general class.

2510 517.521.7 = 6

On the theory of linear transformations and the absolute summation of divergent series. CESCO, P. *Publ. Fac. Cienc. Fis.-Mat. La Plata*, 2, 2, *pp.* 147–156, 1941.

2511 517.544

On the Dirichlet problem for the hyperbolic case. HADAMARD, J. *Proc. Nat. Acad. Sci., Wash.*, 28, *pp.* 258–263, *June*, 1942.

2512 517.65

An infinite integral. WATSON, G. N. *Proc. Camb. Phil. Soc.*, 38, *pp.* 323–324, *July*, 1942.—An illustration of a straightforward method of evaluating integrals which contain a Fourier kernel.

2513 517.912 : 621.3

Analytical methods of solving discrete non-linear problems in electrical engineering. KELLER, E. G. *Trans. Amer. Inst. Elect. Engrs*, 60, *pp.* 1194–1199; *Disc.*, 1389–1390, 1941.—[Abstr. 1302 B (1942)].

2514 517.941.9 : 534.1 : 538.551.25 : 621.316.7

Self-excited oscillations in dynamical systems possessing retarded actions. MINORSKY, N. *J. Appl. Mech.*, 9, *A65–A71*, *June*, 1942.—A variety of dynamical systems, possessing retarded actions, are not entirely describable in terms of differential equations of a finite order. The equations are sometimes designated as hysterodifferential equations. An important case is when the original differential equation for unretarded quantities is a linear equation with const. coeff. and time lags. The characteristic equation, corresponding to the hysterodifferential equation for retarded quantities in such a case, has a series of subsequent high-derivative terms which generally converge. It is possible to develop a simple graphical interpretation for this equation. Such systems are capable of self-excitation.

2515 517.947 : 624.13

Differential equation of a sliding surface in an ideal saturated plastic soil. CARRILLO, N. *J. Math. Phys.*, 21, *pp.* 6–9, *March*, 1942.—The relationship between the stresses acting on a failure surface in a plastic soil and the geometric characteristics of the surface may be expressed by a differential equation, provided the law of failure of the material is known. The mathematical treatment of the problem is simplified if the sliding surface is cylindrical. The analysis is then 2-dimensional and the sliding surface may be considered as a line in a plane.

2516 517.947.43 : 624.13

Simple two- and three-dimensional cases in the theory of consolidation of soils. CARRILLO, N. *J. Math. Phys.*, 21, *pp.* 1–5, *March*, 1942.—Deals briefly with solutions to the differential equation representing heat-flow or soil consolidation.

See Abstr. 2509 517.948 : 513.882 : 517.432

See Abstr. 2544 517.948.33 : 532.74

2517 517.948.34 : 539.31

Note on the integro-differential equation of a problem in the theory of plane stress. HILDEBRAND, F. B. *J. Math. Phys.*, 21, *pp.* 19–22, *March*, 1942.—[See Abstr. 1706 (1940)].

See Abstr. 2560 518.3 : 536.44 : 535.32

2518 518.3 : 541.8

Nomograph for the solubility of chlorine monoxide in water. DAVIS, D. S. *Industr. Engng Chem.*, 34, *p.* 624, *May*, 1942.

See Abstr. 2675 518.4 : 541.123.2

See Abstr. 2677, 2678 518.4 : 541.123.4

2519 518.42 : 532.517

Graphical solution of fluid-friction problems. DENNISON, E. S. *J. Appl. Mech.*, 9, *A82–A84*, *June*, 1942.—The graphical methods described are based upon the use of a simple mathematical device. The effect is to substitute a direct and rapid solution in place of a trial-and-error solution.

2520 518.5 : 548.73

A machine for the computation of structure factors. EVANS, R. C., AND PEISER, H. S. *Proc. Phys. Soc., Lond.*, 54, *pp.* 457–462, *Sept.*, 1942.—A machine is described which evaluates mechanically the expression $2f \cos(hx + ky)$, and its application to the computation of structure factors is discussed.

2521 519.2 : 654.153.4

Delayed-call formulae when calls are served in random order. MELLOR, S. D. *P.O. Elect. Engrs' J.*, 35, *pp.* 53–56, *July*, 1942.—Formulae are developed for estimating the effect of introducing queueing facilities for waiting calls.

2522 519.213 : 511.283

Number of primes and probability considerations. FURRY, W. H., CHERWELL, (LORD). *Nature, Lond.*, 150, *pp.* 120–121, *July* 25, 1942.—A brief discussion of the paradox arising in the application of probability considerations to the determination of the asymptotic density of prime numbers.

2523 519.24 : 620.11

Discussion on "The application of statistical control to the quality of materials and manufactured articles." *J. Instn Elect. Engrs*, 89, *Part I*, *pp.* 303–311, *July*, 1942. *J. and Proc. Instn Mech. Engrs, Lond.*, 147, *pp.* 125–133; *Disc.*, 133–144, *June*, 1942.

2524 519.271.02

On the sum of n observations from different gamma-type populations. RAO, C. R. *Sci. and Cult.*, 7, *pp.* 614–615, *June*, 1942.

2525 519.4

Incomplete block designs for experiments involving several groups of varieties. NAIR, K. R., AND RAO, C. R. *Sci. and Cult.*, 7, *pp.* 615–616, *June*, 1942.

2526 519.49

A generalization of additive ideal theory. GRUNDY, P. M. *Proc. Camb. Phil. Soc.*, 38, *pp.* 241–279, *July*, 1942.—The division of ideal theory into the additive and multiplicative branches of the subject is carried a stage further, showing how the group-theoretic methods of the additive branch can be extended to modules, that is, to Abelian groups, provided the ring of operators is commutative.

ASTRONOMY

2527 523.775

The presence of the heavy isotope of hydrogen in the solar atmosphere. RAO, Y. P. *Sci. and Cult.*, 7, *pp.* 616–617, *June*, 1942.

2528 523.85

Galactic and extragalactic studies. XIII. Note on the comparative diameters of spheroidal and spiral galaxies. XIV. On the magnitude dispersion in the period-luminosity relation. XV. On the distribution of periods for 343 Cepheids in the Small Magellanic Cloud. SHAPLEY, H., MCKIBBEN, V., AND CRAIG, R. A. *Proc. Nat. Acad. Sci., Wash.*, 28, *pp.* 186–204, *May*, 1942.—[See Abstr. 2534 (1941)]. It is shown from a study of 123 galaxies, photographed on standardized plates and measured with a densitometer, that the open spirals are not appreciably larger than the spheroidal galaxies. Spiral arms are therefore to be regarded as internal structural features within the main body of a galaxy. New observations of Cepheids in the Small Magellanic Cloud bring the number of points on the period-luminosity curve up to 564. The scatter from the mean line is not due to accidental superposition of star images except in the nuclear regions, nor to appreciable space absorption in the system. The period-frequency curve is not similar to that obtained in our own Galaxy, partly owing to observational selection in the solar neighbourhood: short periods ($< 3{\cdot}5$ days) predominate. Light curves are given for 16-day Cepheids, which seem common in dense star fields. A distance determination for the faint wing near the Small Magellanic Cloud suggests that it is physically connected with the Cloud. A. HU.

See Abstr. 2506 526.2 : 513.573

2529 526.72

A new determination of the constant of gravitation. HEYL, P. R., AND CHRZANOWSKI, P. *J. Res. Nat. Bur. Stand., Wash.*, 29, *pp.* 1–31, *July*, 1942.—A new determination by the torsion balance has been made in the hope of improving previous results [Abstr. 1477 (1931)]. A number of suggested improvements in the apparatus were tried, and 2 of these were adopted. The result obtained shows slight improvement.

PHYSICS: GENERAL

2530 53.081.5

The dimensions of physical quantities. SELWYN, E. W. H. *Proc. Phys. Soc., Lond.*, 54, *pp.* 428–435, *Sept.*, 1942.—The simple form of relation between physical quantities which is assumed in considerations of the dimensions of physical quantities may be regarded as a consequence of the equality of 2 measures of a physical quantity, on any system of units, if they are equal on one system. The argument is extended to cover the method of dimensions.

2531 53.087.6

A recording paper for field and general use. TARRANT, A. G. *Nature, Lond.*, 150, *pp.* 153–154, *Aug.* 1, 1942.

2532 530.145 : 532.13 : 536.48

The theory of superfluidity of helium II. LANDAU, L. *J. Phys., U.S.S.R.*, 5, 1, *pp.* 71–90, 1941.—The quantization of an arbitrary system of interacting

particles (a liquid) is performed by means of introducing the operators of the density and of the velocity of the liquid; the commutation rules between these operators are determined. From the results the general character of the distribution of the energy levels in the spectrum of a quantum liquid is determined. The temperature dependence of the heat capacity of helium II is investigated. It is shown that at absolute zero a quantum liquid can possess the property of superfluidity. At non-zero temperatures it is found that 2 motions—a superfluid and a normal—can simultaneously exist in helium II. This can be described by means of the conception of the superfluid and normal parts of the liquid; the λ-point in helium II is connected with the disappearance of the superfluid part of the liquid. The experiments made to measure the heat conductivity and viscosity of helium II are interpreted. The thermomechanical effects in helium II are considered. A system of hydrodynamic equations is advanced describing the macroscopic motion of helium II. By means of these equations the propagation of sound is investigated and it is shown that 2 velocities of sound must exist in helium II.

2533 530.145.63 : 535.13 = 3

Theory of interaction of mesons with the electromagnetic field. GINSBURG, W. L. *J. Phys., U.S.S.R.*, 5, 1, *pp.* 47–57, 1941.—The interaction of mesons with the electromagnetic field is dealt with on the basis of Tamm's corpuscular theory of the meson. The eigenenergy of the meson is deduced and the behaviour of its magnetic moment for high energies is investigated. Some difficulties in meson theory are discussed. [See Abstr. 4466 (1939)]. A. J. M.

2534 531.724 : 541.183.2

Adsorption of vapours by crystalline solid surfaces. GANS, D. M., BROOKS, U. S., AND BOYD, G. E. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 396–399, *May* 15, 1942.—The problem of the determination of the surface area of a finely divided powder has been considered by the intercomparison of values obtained from the adsorption of water, propyl alcohol, and benzene vapours at 25°C., and the adsorption of nitrogen gas at −195·5°C.

2535 531.724 : 541.183.26

Measuring the specific surface of particulate substances. SMITH, D., AND GREEN, H. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 382–386, *May* 15, 1942.—A water vapour adsorption method has been developed for determining the sp. surface of particulate substances. The measurements are made at atm. pressure. This method makes possible determination of the surface shape factor and investigation of the particle size of materials too fine-grained to be measured with the microscope. A table of the sp. surfaces of a number of particulate substances is included.

See Abstr. 2706 532.1 : 541.18

See Abstr. 2551 532.12 : 534.22

See Abstr. 2543 532.13 : 536.423 : 532.733

See Abstr. 2532 532.13 : 536.48 : 530.145

2536 532.13 + 539.374] : 537.222 = 3

Dependence on temperature of viscosity, dielectric relaxation and the changes in position in amorphous solids and liquids. HOLZMÜLLER, W. *Phys. Z.*, 42, 15–16, *pp.* 273–281, *Sept.*, 1941.—The motions of translation are considered, and, in particular, the dependence on temperature of changes in position. In liquids the potential rises are small and of the same order of magnitude (1 relaxation time). In amorphous solids, owing to the different forces at work, various large potential rises occur, pointing to the existence of several relaxation times. The temperature dependence can be calculated starting with the Boltzmann rule. The results, for one relaxation time, conform to the exponential formula for liquids for the temperature dependence of viscosity. At high temperatures the spectrum of the relaxation time is constricted, which explains the increase of the loss-angle max., whereas at low temperatures, owing to the long relaxation times of the large potential rises, the viscosity increase is considerable. It was found impossible to represent the dependence on temperature of the viscosity of a substance from the state of liquid to the highly viscous melt by a simple exponential function. H. G. S.

See Abstr. 2540 532.14 : 541.68 : 532.612

See Abstr. 2519 532.517 : 518.42

2537 532.542.2

Steady flow in the transition length of a straight tube. LANGHAAR, H. L. *J. Appl. Mech.*, 9, *A55–A58*, *June*, 1942.—By means of a linearizing approximation, the Navier–Stokes equations are solved for the case of steady flow in the transition length of a straight tube. The family of velocity profiles is defined by Bessel functions, and the parameter of this family is tabulated against the axial co-ordinate in a dimensionless form. Hence, the length of transition is obtained. The pressure function is derived from the computed velocity field by means of the energy equation, and the pressure drop in the transition length is defined by a dimensionless const. = 2·28.

2538 532.543

Equation of motion for the steady mean flow of water in open channels. KEULEGAN, G. H. *J. Res. Nat. Bur. Stand., Wash.*, 29, *pp.* 97–110, *July*, 1942.—It is shown that in the form of equation containing the Boussinesq coeff. the friction coeff. is related directly to the wall friction. In the form of equation containing the Coriolis coeff. the friction coeff. is related to the rate of energy loss in the water. This has a direct bearing on the correct use of Manning's "n" in the equation of flow in open channels.

2539 532.6/7 : 576.35

A mathematical analysis of elongation and constriction in cell division. LANDAHL, H. D. *Bull. Math. Biophys.*, 4, *pp.* 45–62, *June*, 1942.—An equation for the rate of elongation of a dividing egg is integrated and generalized. The rates of elongation and constriction of a number of eggs under various conditions are analysed and compared with the theoretical predictions.

2540 532.612 : 532.14 : 541.68

A study of organic parachors. V. Constitutive variations of the parachors of a series of normal ketones. OWEN, K., QUAYLE, O. R., AND CLEGG, W. J. *J. Amer. Chem. Soc.*, 64, *pp.* 1294–1296, *June*, 1942.—[See Abstr. 60 (1940)]. The surface tensions, densities and parachors, of the 15 normal

ketones of 11 or less carbons were determined. The parachor value for the carbonyl group has been found to be definitely constitutive and to decrease with the size of the attached alkyl groups.

2541 532.62 : 536.76 : 536.581

A superliquid in two dimensions and a first-order change in a condensed monolayer. I. Energy, compressibility and order of phase transformations. HARKINS, W. D., AND COPELAND, L. E. *J. Chem. Phys.*, 10, *pp.* 272–286, *May*, 1942.—The transition from a liquid to a vapour in a 2-dimensional system (monolayer) may exhibit the characteristics of a first- or of a second-order change. However, all transitions (e.g. fusion) in liquid and solid monolayers found heretofore have been of the second or third order. A new superliquid phase and a first-order transition as related to the pressure-area-temperature diagram of octadecanol is described; the phase has remarkable properties and its discovery has compelled an extension of the classification of phases. The lat. ht. of the first-order transition was calculated by Clapeyron's equation and the energy of expansion of the monolayers was evaluated. One of the most remarkable features is the extremely great change in the properties of these highly condensed monolayers, which is brought about by extremely small, previously undetectable changes of molecular area. A new type of thermostat was designed. H. H. HO.

2542 532.72 : 541.123.012.5

Separation of liquids from binary liquid mixtures by the method of thermal diffusion. NIYOGI, K. C. *Sci. and Cult.*, 7, *pp.* 567–568, *May*, 1942.—Experiments on various organic mixtures show that the conc. of the component having the greater density invariably occurs at the bottom of the column. Hence it is probable that density and not mol. wt. determines this increase in conc. It is thus unnecessary to assume polymerization to explain cases of increased conc., at the lower end, of the component with smaller mol. wt. N. M. B.

2543 532.733 : 536.423 : 532.13

The cloud point of varnish resins in drying oils. POWERS, P. O. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 387–391, *May* 15, 1942.—The temperature at which a heated mixture of varnish resin and a selected mineral oil clouds on cooling is a useful index of the relative solubility of the resin. The solubility achieved by heating mixtures of resin and drying oil may be measured by mixing the drying oil and resin with a suitable mineral oil and determining the temperature at which the mixture clouds.

2544 532.74 : 517.948.33

The radial distribution function in liquids. KIRKWOOD, J. G., AND BOGGS, E. M. *J. Chem. Phys.*, 10, *pp.* 394–402, *June*, 1942.—In accordance with the general methods [Abstr. 2653 (1935)], an integral equation is evolved for the radial distribution function for pairs in a liquid, and an approx. solution is effected for a system of hard spheres. The form of the function depends on a single parameter λ which can be related to certain observed physical properties of the liquid and to the dia. of closest approach. The theoretical function has been calculated for a value of λ appropriate to liquid A at 90°K. and compared with exp. radial distribution functions derived from X-ray scattering data. [See Abstr. 4441 (1939)].

2545 532.77

Temperature and composition coefficients of the density, refractive index and viscosity of the methyl-alcohol–dioxane system. AMIS, E. S., CHOPPIN, A. R., AND PADGITT, F. L. *J. Amer. Chem. Soc.*, 64, *pp.* 1207–1212, *May*, 1942.—The densities, refractive indexes and viscosities of mixtures of methyl alcohol and dioxane were measured over a complete range of composition and at several temperatures. The composition coeff. equations are given and the const. of these equations tabulated.

2546 532.77

Boiling-point–composition data of the methyl-alcohol–dioxane system. PADGITT, F. L., AMIS, E. S., AND HUGHES, D. W. *J. Amer. Chem. Soc.*, 64, *pp.* 1231–1232, *May*, 1942.

2547 532.77

Freezing points of binary mixtures of diphenylamine and other organic compounds. NELSON, O. A., AND SMITH, L. E. *J. Amer. Chem. Soc.*, 64, *pp.* 1057–1059, *May*, 1942.

See Abstr. 2548 532.77 : 532.782

See Abstr. 2597 532.77 : 536.423.15 : 536.653

See Abstr. 2594 532.773 : 536.653 : 536.632

2548 532.782 : 532.77

The solubility of sodium carbonate in fused sodium hydroxide. SEWARD, R. P. *J. Amer. Chem. Soc.*, 64, *pp.* 1053–1054, *May*, 1942.—F.p. measurements have been made on NaOH-Na_2CO_3 mixtures up to 35% carbonate. The f.p. of NaOH was found to be 320° and the transformation point 294°. The addition of Na_2CO_3 reduces the f.p. until a eutectic at 286° with a Na_2CO_3 content of 22% is reached. The heat of fusion of NaOH was calculated to be 1670 cal./mole.

2549 533.21

Compressor design for the process industries. YORK, JR., R. *Industr. Engng Chem.*, 34, *pp.* 535–544, *May*, 1942.—The cases considered are perfect or theoretical compressors operating on perfect gases, actual compressors operating on perfect gases, actual compressors operating on imperfect gases, and actual compressors operating on mixtures of imperfect gases.

SOUND. VIBRATIONS

See Abstr. 2514 534.1 : 538.551.25 : 517.941.9 : 621.316.7

2550 534.13.013 : 621.824 : 512.831

The matrix theory of torsional oscillations. PIPES, L. A. *J. Appl. Phys.*, 13, *pp.* 434–444, *July*, 1942.—The general case of vibration of a shaft with several rotating masses is discussed. The analysis is reduced to a simple matrix multiplication of second-order matrices and the natural frequencies of symmetrical systems are discussed. The connection of the matrix method and the well-known Holzer method of computing the natural frequencies of torsional oscillations is considered. The analysis of geared systems and continuous shafts is discussed.

2551 534.22 : 532.12

Adiabatic compressibilities of oils. SREE. *J. Mysore Univ.*, 2, 13, *pp.* 95–97, 1942.—The com-

pressibilities of several vegetable, fish and essential oils, were determined from the ultrasonic velocities in the oils and the densities. Light of wavelength 461 Å was employed and the diffraction pattern was photographed with a lens of 3 m. focal length. The ultrasonic frequency lay between 5 and 8 Mc./s. and values found lay between $4{\cdot}73 \times 10^{11}$ (cod-liver oil) and $6{\cdot}80 \times 10^{11}$ c.g.s. (turpentine). G. E. A.

2552 534.22 : 541.25

Velocity of sound in liquids and molecular volume. RAO, M. R. *J. Mysore Univ.*, 2, 12, *pp.* 89–93, 1942.—Extension of a previous paper [Abstr. 3183 (1940)]. Since $v = 1/\sqrt{\beta_\varphi \rho}$, where β_φ is the adiabatic compressibility of a fluid, and the compressibility increases with temperature, the velocity of sound in a liquid becomes zero at the critical temperature. The constant R is an additive function of the chemical composition and the ratio of R to the mol. critical vol. V_c is a const. for most substances, and is given by $R = \alpha(\theta_c/M)^{\frac{1}{4}}V_c$, where θ_c is the critical temperature, M the mol. wt. and α a const. A table is given, for a number of substances, mostly organic but including N, O and A, of the values of R, R/V_c and α, in which the constancy of α is more satisfactory than of R/V_c. If ϕ_o and r_o are const. of energy and of length characteristic of the molecule, R is also expressed by $\delta(\phi_o/M)^{\frac{1}{4}}r_o^3$. A table gives the values of R, δ, r_o and ϕ_o, for nitrogen and argon. G. E. A.

2553 534.372 : 621.165

Model tests of two types of vibration dampers. MEYER, C. A., AND SALDIN, H. B. *J. Appl. Mech.*, 9, *A59–A64*, *June*, 1942.—Deals with the construction and tests of 2 types of vibration dampers, selected from a number of original proposals, designed to damp out the vibration in steam-turbine impulse blades. These dampers were tested using models constructed of such size and physical dimensions as to simulate the conditions of operation in the actual turbine blade. Test results show that, if a properly designed damper is attached to a freely vibrating system having 26 times the mass of the damper, it will reduce an initial deflection of the vibrating system to 4% of its value in 10 cycles.

2554 534.414

Experiments with Helmholtz resonators. BROWNING, H. M. *Phil. Mag.*, 33, *pp.* 551–556, *July*, 1942.—A series of experiments was carried out to determine under what conditions and to what accuracy Helmholtz's theory is correct in the case of a cylindrical resonator with a neck of constant length.

2555 534.7/8 : 621.396.813

Hearing, the determining factor for high-fidelity transmission. FLETCHER, H. *Proc. Inst. Radio Engrs, N.Y.*, 30, *pp.* 266–277, *June*, 1942.—[Abstr. 1437 B (1942)].

2556 534.75

An alternate approach to the mathematical biophysics of perception of combinations of musical tones. RASHEVSKY, N. *Bull. Math. Biophys.*, 4, *pp.* 89–90, *June*, 1942.—In connection with a previous paper [Abstr. 1769 (1942)] this different approach to the problem is outlined, which also leads to an expression for pleasantness values of different binary combinations of musical sounds.

OPTICS

See Abstr. 2533 535.13 : 530.145.63

2557 535.14 = 3

Derivation of the frequency condition $E\rho h = h\nu$. GRUBER, F. *Ann. Phys., Lpz.*, 41, 2, *pp.* 167–171, 1942.—From simple, fundamental assumptions of the light-quantum theory the relation between the frequency and the energy of a photon is derived, and a correction is introduced into the relation between the absorbed or emitted frequency and the energy change of the absorbing or emitting atom. H. G. S.

2558 535.14 : 537.591.5

The influence of radiation damping on the scattering of mesons. II. Multiple processes. HEITLER, W., AND PENG, H. W. *Proc. Camb. Phil. Soc.*, 38, *pp.* 296–312, *July*, 1942.—[See Abstr. 2401 (1941)]. A general argument can be given for omitting the diverging parts of any quantized field interacting with a particle. The field equations thus freed from all singularities still contain the reaction of the field on the particle to the same extent as the reaction can be derived classically from the conservation of energy. The new field equations can be solved generally in terms of a simultaneous set of integral equations. The new field equations are applied to the multiple processes of the meson theory.

2559 535.23.08 : 537.531 : 621.386.8 : 615.84

The measurement of radiation for medical purposes. MAYNEORD, W. V. *Proc. Phys. Soc., Lond.*, 54, *pp.* 405–421, *Sept.*, 1942.—The ionization method of measuring X-rays and γ-rays is briefly described and the fundamental nature of the röntgen is discussed. The distribution of radiation throughout a body subjected to X- or γ-irradiation is considered, and examples given of the variation of dosage-rate in typical cases. This leads to a study of isodose surfaces. The relationships between the dose in röntgens and the energy absorbed per unit mass of material or the energy flux per cm.^{2} of cross-section of the beam are indicated. Integrating the product of the dose and element of mass throughout the whole mass gives the integral dose. Simple geometrical and analytical methods are described. The significance of total energy absorption is indicated. The total amounts of energy involved in the therapeutic use of ultra-violet and infra-red radiations are compared with those of X-rays and γ-rays.

See Abstr. 2626, 2627 535.3 : 537.531

See Abstr. 2628 535.3 : 548 : 537.531

2560 535.32 : 536.44 : 518.3

Molecular-refraction – critical-temperature nomograph. DAVIS, D. S. *Industr. Engng Chem.*, 34, *p.* 689, *June*, 1942.

See Abstr. 2718 535.32 : 541.6

2561 535.33.03

Selective excitation of spectra by the high-frequency discharge. ASUNDI, R. K., SINGH, N. L. *Nature, Lond.*, 150, *p.* 123, *July* 25, 1942.

2562 535.336.2

The detection of free radicals by means of a mass spectrometer. ELTENTON, G. C. *J. Chem. Phys.*, 10, *p.* 403, *June*, 1942.

2563 535.338.3

Note on an anomaly in the spectrum of O^{++}. JEFFREYS, B. *Proc. Camb. Phil. Soc.*, 38, *pp.* 290–295, *July*, 1942.

See Abstr. 2639 535.338.3 : 538.615

2564 535.342 : 541.651.22

On light absorption of polycyclic internally complex compounds. KISS, A. VON, CSOKAN, P., AND NYIRI, G. *Z. phys. Chem. A*, 190, *pp.* 65–80, *Jan.*, 1942.—With methods previously described [see Abstr. 4531 (1937)] extinction curves were determined for amino-acetic acid and for salicylaldehyde-ethylene-diimine and their internally complex salts formed with various metals. The mechanism of light absorption, especially in its relation to main and residual valency bonds and the mutual influence of the chromophore groups, are discussed and some space models of the complex salts are given. R. N.

See Abstr. 2573 535.343–1 : 535.375.5

2565 535.343 – 3

Ultra-violet absorption of vitamin A in various solvents. ZSCHEILE, F. P., AND HENRY, R. L. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 422–425, *May* 15, 1942.

2566 535.349 : 771.53

Note on the transmission of photographic layers in the ultra-violet. SWEET, M. H. *J. Opt. Soc. Amer.*, 32, *pp.* 324–325, *June*, 1942.

2567 535.37

The fatigue effect in luminescent materials. BEESE, N. C., AND MARDEN, J. W. *J. Opt. Soc. Amer.*, 32, *pp.* 317–323, *June*, 1942.—Measurements made on inorganic phosphors, organic substances such as anthracene, and on fluorescent canary glass, showed that the losses increased with time and intensity of irradiation. The phenomenon can be demonstrated with liquids as well as with solid crystalline material. Equilibrium conditions were attained in about 10 min. Both ultra-violet radiations at 2 537 Å and radiations at 3 650 Å were used. The recovery from fatigue was demonstrated with a number of substances.

2568 535.37 = 3

On phosphorescence centres. BANDOW, F. *Ann. Phys., Lpz.*, 41, 2, *pp.* 172–176, 1942.—In view of the rejection by Riehl, in his recent book on Physics and Technical Applications of Luminescence, of Lenard's representation of the existence in a phosphor of centres having different life-periods of after-glow, experiments are conducted with blue-luminous CaSBiα phosphor, the results of which confirm Lenard's representations. H. G. S.

2569 535.375.5

Raman spectra of some aromatic carbonyl and nitro compounds. MURRAY, M. J., CLEVELAND, F. F., AND SAUNDERS, R. H. *J. Amer. Chem. Soc.*, 64, *pp.* 1181–1184, *May*, 1942.—Raman frequencies, estimated intensities and depolarization factors, are reported. For acetophenone, the only one for which previous data seem to have been reported, new lines were observed at 404, 896 and 3 006 cm.$^{-1}$ and depolarization data were obtained for 11 additional lines.

2570 535.375.5

Studies on the Raman effect: mononitroparaffins. WITTEK, H. *Z. phys. Chem. B*, 51, *pp.* 187–199, *April*, 1942.—Raman spectra were investigated with large dispersion for nitromethane, -ethane, -*n*-propane, -*i*-propane and -*n*-butane. For the 4 last-named substances the polarization was determined. The spectra of the 4 first-named substances were analysed and the lines co-ordinated with the chain- and CH-oscillations. R. N.

2571 535.375.5

Polarization measurements of Raman lines. GLOCKLER, G., AND BAKER, H. T. *J. Chem. Phys.*, 10, *p.* 404, *June*, 1942.

2572 535.375.5

Association effects in the Raman spectra of solutions of thiophenol in donor solvents. SAUNDERS, R. H., MURRAY, M. J., AND CLEVELAND, F. F. *J. Amer. Chem. Soc.*, 64, *pp.* 1230–1231, *May*, 1942.

2573 535.375.5 : 535.343 – 1

The vibrational spectra of pyrrole and some of its deuterium derivatives. LORD, JR., R. C., AND MILLER, F. A. *J. Chem. Phys.*, 10, *pp.* 328–341, *June*, 1942.—The Raman spectra of pyrrole, pyrrole-*N*-*d*, symmetrical pyrrole-d_4 and pyrrole-d_5, have been studied with a high-speed grating spectrograph. The infra-red absorption spectra of the same compounds have been investigated in the liquid state in the region 750–1 900 cm^{-1}. With the selection principles and Teller's product rule, these spectra are analysed for a molecule of C_{2v} symmetry. The analysis yields values for 23 fundamental frequencies. The spectra indicate a C_{2v} structure for pyrrole, although a C_s (non-planar) structure cannot yet be rigorously excluded.

2574 535.375.5 : 541.57

Raman effect and hydrogen bonds. I. Mixtures of esters and acceptor molecules. MURTY, G. V. L. N., AND SESHADRI, T. R. *Proc. Indian Acad. Sci. A*, 14, *pp.* 593–603, *Nov.*, 1941.—A brief survey of existing literature on H bonds is given. The advantages of employing the Raman effect for investigations in this field are discussed. The results supplement those obtained from infra-red studies but become more definite, particularly when such groups as the C = O are employed. H-bond formation between various esters as donor molecules and phenol, alcohols and chloroform as acceptor molecules has been studied. The changes in the C = O frequencies are classified.

2575 535.413 : 548 = 3

On the analysis of anomalous crystal-optical interference colours. BUCHWALD, E. *Phys. Z.*, 42, *pp.* 203–208, *Aug.*, 1941.—The calculations established previously [Abstr. 1785 (1941)] are extended to observations with different varieties of apophyllite and the results interpreted from considerations of the position of the dark interference bands in the spectrum. H. G. S.

2576 535.542.1 = 3

Recent research on the Sénarmont compensator. GABLER, F., AND SOKOB, P. *Z. Instrumkde.*, 61, *pp.* 298–311, *Sept.*, 1941.—The theory and use of the compensator, taking into account the multiple reflections at the boundary surfaces of the plates, is dealt with. With either a Schönrock or Chauvin analyser the phase difference is calculated from the same formula as for no reflections, but in the calculation the mean must be taken of 2 different half-

shadow azimuths obtained by placing the compensator plate first in azimuth ϕ and then in azimuth $\phi + \pi/2$. H. G. S.

2577 535.542.1 = 3

On the measurement of phase differences with the Sénarmont compensator. GABLER, F., AND SOKOB, P. *Phys. Z.*, 42, *pp.* 319–323, *Sept.*, 1941.—A revision of the theory and adjustments of the compensator dealt with in former contributions [Abstr. 4499 (1938), 756 and 2576 (1942)], with a discussion of errors arising from disregard of the internal reflections. H. G. S.

2578 535.563

Optical rotation of petroleum fractions. FENSKE, M. R., CARNAHAN, F. L., BRESTON, J. N., CASER, A. H., AND RESCORLA, A. R. *Industr. Engng Chem.*, 34, *pp.* 638–646, *May*, 1942.—The rotatory power of distillate fractions from an Oklahoma crude is first evident in the gas-oil range and reaches a max. in the lubricant portion. Commercial neutrals from several crudes of various geographical origins evidence rotational max. of different values in distillate fractions of about the same mol. wt. and b.p. As a primary means of concentrating optically active material, fractional solvent extraction seems less effective than fractional distillation, but the situation is reversed for secondary operations or for fractions that have been originally concentrated in optically active components by distillation.

2579 535.7 : 771.54 : 621.397.6

The relative sensitivities of television pick-up tubes, photographic film, and the human eye. ROSE, A. *Proc. Inst. Radio Engrs, N.Y.*, 30, *pp.* 293–300, *June*, 1942.—[Abstr. 1441 B (1942)].

2580 535.81 : 681.4.02 = 3

Studies on the dynamic lens. I. MEIER, F., AND DESSAUER, F. **II.** DESSAUER, F. *Helv. Phys. Acta*, 14, 4, *pp.* 271–280, *and* 14, 7, *pp.* 574–582, 1941.—The investigation concerns the manufacture of lenses of variable focus akin to the human eye. The lens consists of a shell, of which the shape can be changed dynamically and which is filled with the substance, usually a liquid or liquid mixture, providing the optical constants. The shell should not affect the optical properties of the lens. It is shown that, to a 1st approx., the effective refractive surfaces are parabolic. In Part II the optical possibilities are discussed. The field of application of the dynamic construction, as indicated by the state of the research to date, ranges from large dia. lenses, e.g. projection lenses, telescope lenses, etc., down to spectacles, but the lens material is as yet unsuitable for microscope objectives and similar purposes. H. G. S.

2581 535.87 : 621.357.5

Silver plating of optical glassware. BARNARD, R. D. *Industr. Engng Chem.*, 34, *pp.* 637–638, *May*, 1942.—[Abstr. 1395 B (1942)].

HEAT. THERMODYNAMICS

2582 536.1

A dynamical treatment of the elements of heat. BROWN, G. B. *Phil. Mag.*, 33, *pp.* 543–551, *July*, 1942.—The elements of the subject of heat are developed from consideration of the dynamical effects produced by heat in a similar manner to that used in the development of electric and magnetic theory. A dynamical scale of temperature independent of the properties of any particular substance follows naturally and the unit of quantity of heat becomes the erg. This leads to a foundation of calorimetry directly on the principle of the conservation of energy.

2583 536.21

Temperatures in solids during heating or cooling. Tables for the numerical solution of the heating equation. OLSON, F. C. W., AND SCHULTZ, O. T. *Industr. Engng Chem.*, 34, *pp.* 874–877, *July*, 1942.—Tables are presented for obtaining accurate solutions of problems in the conduction of heat. The theory is described briefly, and examples are given.

See Abstr. 2618 536.21 : 548 : 537.312.8

2584 536.421 : 548 = 3

Equilibrium and nucleus formation in melting and solidification. DEHLINGER, U. *Phys. Z.*, 42, *pp.* 197–203, *Aug.*, 1941.—The limits of validity of the Lennard–Jones model for rare gases [Abstr. 2949 (1939)] are discussed and a modification given for metals characterized by the average co-ordination number, and thus the energy interaction due to disorder, decreasing to a lesser extent in the crystal-melt transition. The thermodynamic conditions near the m.p. closely resemble those in the homogeneous random transition in mixed crystals. By means of a differential equation for the growth of a statistical fluctuation, nucleus formation in the under-cooled melt is described. Qualitatively, the dependence on temperature agrees with experience. In the interior of a melting crystal, nucleus formation is prevented by the greater tensions. H. G. S.

See Abstr. 2543 536.423 : 532.13 : 532.733

See Abstr. 2597 536.423.15 : 532.77 : 536.653

See Abstr. 2589 536.423.15 : 536.63

2585 536.44

Prediction of critical constants. MEISSNER, H. P., AND REDDING, E. M. *Industr. Engng Chem.*, 34, *pp.* 521–526, *May*, 1942.—Relations are proposed for predicting critical constants. They may be applied to any substance which is not highly associated and whose structural formula is known.

2586 536.44

Critical states of two-component paraffin systems. MAYFIELD, F. D. *Industr. Engng Chem.*, 34, *pp.* 843–849, *July*, 1942.—Empirical correlations of literature data are presented by means of which critical temperatures, pressures and compositions of 2-component normal paraffin hydrocarbon systems can be predicted. Values calculated by means of these correlations are compared with existing published data.

See Abstr. 2560 536.44 : 518.3 : 535.32

See Abstr. 2532 536.48 : 532.13 : 530.145

See Abstr. 2541 536.581 : 536.76 : 532.62

2587 536.6/7

Thermodynamic properties of light hydrocarbons. HOLCOMB, D. E., AND BROWN, G. G. *Industr. Engng Chem.*, 34, *pp.* 590–602, *May*, 1942.—The thermal properties of hydrocarbon mixtures covering the pressure range from 0 to 10 000 lb./in.^{2} abs. and

the temperature range from − 200° to + 1 100°F. for vapours and from 0° to 320°F. for liquids are presented in graphical form. The reference state for all enthalpies was selected as liquid at zero abs. pressure and 32°F. In making heat balance, the enthalpies of liquid and vapour streams are added or subtracted after applying any necessary corrections for the effect of pressure on the enthalpy of the fluid.

2588 536.6/7

The heat capacity and entropy, heats of fusion and vaporization and the vapour pressures of isopentane. SCHUMANN, S. C., ASTON, J. G., AND SAGENKAHN, M. *J. Amer. Chem. Soc.*, 64, *pp.* 1039–1043, *May*, 1942.—The heat capacity from 12°–290°K., the v.p. from 240°–290°K., the m.p., the b.p. and the heats of fusion and vaporization, have been directly determined. An empirical formula has been derived for the vapour pressure over the observed range of temperature and from it values of the b.p. and the heat of vaporization have been calculated. The molal entropies of the gas and liquid, as well as the potential of the torsional motion between the ethyl and isopropyl groups in isopentane, have been calculated from the above data. The free energies of neopentane, isopentane and *n*-pentane at 298°K. have also been calculated from these and previously obtained data.

2589 536.63 : 536.423.15

The heat capacity and vapour pressure hysteresis in liquid isopentane. Isomers due to hindered rotation. ASTON, J. G., AND SCHUMANN, S. C. *J. Amer. Chem. Soc.*, 64, *pp.* 1034–1038, *May*, 1942.—An exhaustive study of the heat capacity of liquid isopentane has been made in the range 180° to 240°K. with a precision of 0·06%. Hysteresis in the heat capacity has been found for the liquid in this region. Simultaneous v.p. measurements exhibit hysteresis effects of about 100 times the precision of measurement. The results are considered as due to the slow transfer of one into the other of the isomeric forms made possible by restricted rotation.

2590 536.63 : 539.133

Heat capacity of certain halomethanes. GLOCKLER, G., AND EDGELL, W. F. *Industr. Engng Chem.*, 34, *pp.* 532–534, *May*, 1942.—A semi-empirical method of calculating heat capacities based on the additive contributions of the bonds and angles which make up the molecule is presented.

2591 536.63 : 548

Energy states of solids: evidence from thermal data for the existence of low electronic energy levels in europium ion. The heat capacity of europium sulphate octahydrate from 60° to 300°K. LONG, E. A., AND DEGRAFF, R. A. *J. Amer. Chem. Soc.*, 64, *pp.* 1346–1349, *June*, 1942.—The electronic heat capacities of Eu ion were obtained from heat-capacity data. The crystalline field about the Eu ion in this salt is probably not one of pure cubic symmetry, but a small rhombic contribution must be considered.

2592 536.631

Specific heat of the synthetic rubber hycar O.R. from 15° to 340°K. BEKKEDAHL, N., AND SCOTT, R. B. *J. Res. Nat. Bur. Stand., Wash.*, 29, *pp.* 87–95, *July*, 1942.—Measurements of sp. ht. were made by an adiabatic vacuum-type calorimeter. The experimental values betw. 15° and 22°K. were well represented by the Debye equation, using a βv value of 80, and accordingly the values below 15°K. were calculated with this equation. At about 250°K. the material has a transition of the second order. From 250° to 340°K. the sp. ht./temperature curve is nearly linear, and the values can be calculated to within 0·2% from the formula $C_p = 0{\cdot}00283T + 1{\cdot}126$. The increase in entropy resulting from heating from 0° to 298·16°K. was calculated to be (1·743 ± 0·002) Int. joules $g.^{-1}$ $deg.^{-1}$.

2593 536.631

The beta-anomaly of Ruhemann and Simon in rubber. WOOD, L. A. *J. Chem. Phys.*, 10, *pp.* 403–404, *June*, 1942.

2594 536.632 : 536.653 : 532.773

Specific heats and heats of dilution of concentrated sodium hydroxide solutions. WILSON, H. R., AND MCCABE, W. L. *Industr. Engng Chem.*, 34, *pp.* 558–566, *May*, 1942.—Data are given on the sp. ht. of caustic soda solutions over a conc. range of 50·2% to 75·9% and a temperature range of 81·6° to 254·6°F., and on heats of dilution over a conc. range of 48·64% to 75·51% at 200°F. The results are combined with existing data for lower conc., and an enthalpy/conc. chart is given covering a range of 0 to 80% NaOH and a temperature range 100° to 400°F.

2595 536.633 : 662.61

Equations for the specific heats of gases. SMALLWOOD, J. C. *Industr. Engng Chem.*, 34, *pp.* 863–864, *July*, 1942.—The paper presents condensed equations for the gases entering the combustion of fuels and the products of combustion.

2596 536.653

Heats of solution of the system sulphur-trioxide–water. MORGEN, R. A. *Industr. Engng Chem.*, 34, *pp.* 571–574, *May*, 1942.—Values are given for partial molal heats for the system SO_3-H_2O which include all conc. for H_2SO_4 in water and oleums up to 100% free SO_3.

See Abstr. 2594 536.653 : 532.773 : 536.632

2597 536.653 : 536.423.15 : 532.77

Vapour-pressure/temperature relations and heats of solution and dilution of the binary system manganous-nitrate–water. EWING, W. W., GLICK, C. F., AND RASMUSSEN, H. E. *J. Amer. Chem. Soc.*, 64, *pp.* 1445–1449, *June*, 1942.—Data for the system manganous-nitrate–water are given for conc. up to 24 *m*. They include v.p. for the unsaturated, saturated and supersaturated solutions and for mixtures of the crystals of 2 hydrates. The heat of solution of manganous nitrate anhydride was measured, and the heats of dilution of solutions of the salt measured for conc. up to 24 *m*.

2598 536.659

The energy of immersion of crystalline powders in water and organic liquids. I. BOYD, G. E., AND HARKINS, W. D. *J. Amer. Chem. Soc.*, 64, *pp.* 1190–1194, *May*, 1942.—The heat of immersion (h_i) has been determined for 10 solids in from 1 to 9 liquids, and was found to vary from 0·3 to 1·8 cal. $g.^{-1}$ in water, with smaller values for organic liquids. The ratio $h_i/(h_i)_{H_2O}$ depends almost wholly upon the nature of the liquid for which h_i is determined, and not upon

the solid immersed, provided polar liquids only are investigated. The value of the ratio is different if the powder consists of a non-polar solid, such as graphite, when the value of h_l for any organic liquid approaches much more closely that for water.

2599 536.659

The binding energy between a crystalline solid and a liquid: the energy of adhesion and emersion. Energy of emersion of crystalline powders. II. HARKINS, W. D., AND BOYD, G. E. *J. Amer. Chem. Soc.*, 64, *pp.* 1195–1204, *May*, 1942.—The increase of enthalpy (h_E) or of internal energy (ϵ_E) which accompanies the emersion of various polar solids from water was measured. The values become lower as the liquid, from which the solid is emersed, becomes less polar. The energies of adhesion for the separation of the solid from the liquid are given.

2600 536.666 : 541.128

Heats of catalytic hydrogenation in solution. I. Apparatus, technique, and the heats of hydrogenation of certain pairs of stereoisomers. WILLIAMS, R. B. *J. Amer. Chem. Soc.*, 64, *pp.* 1395–1404, *June*, 1942.—A calorimeter and technique for measuring the heats of catalytic hydrogenations in solutions at room temperature with a precision of the order of 0·5% are described. The accuracy of the results has been proved by determining the heat of hydrogenation of *n*-heptane-1 in glacial acetic acid at 302°K., and comparing the value for the gaseous hydrogenation at 355°K., derived from these solution measurements, with that obtained directly by Kistiakowsky and his co-workers.

2601 536.7 : 541.122

Applications of thermodynamics to multicomponent systems. SAGE, B. H., AND OLDS, R. H. *Industr. Engng Chem.*, 34, *pp.* 526–532, *May*, 1942.—Some of the simpler applications of thermodynamics to multicomponent systems are indicated. The utility of the chemical potential or the fugacity of a component in the estimation of the phase behaviour of a complex system is discussed. Experimental values of the partial enthalpy of methane, ethane and propane in liquid-phase systems containing a hydrocarbon liquid of high mol. wt., are recorded for a range of compositions and temperatures. The application of the general energy equation for steady flow to the passage of heterogeneous mixtures through branch conduits is illustrated.

See Abstr. 2697 536.7 : 541.134

2602 536.71

Generalized thermodynamic properties of gases at high pressures. MARON, S. H., AND TURNBULL, D. *Industr. Engng Chem.*, 34, *pp.* 544–551, *May*, 1942.—Methods for the estimation of thermodynamic properties of gases at h.p. are discussed. The generalization of the Beattie–Bridgeman equation of state is reviewed and extended. A new empirical equation of state is presented, and generalized equations for various thermodynamic properties are deduced from it.

2603 536.717

Mollier diagrams for theoretical alcohol-air and octane-water-air mixtures. WIEBE, R., SHULTZ, J. F., AND PORTER, J. C. *Industr. Engng Chem.*, 34, *pp.* 575–580, *May*, 1942.—Sample calculations show that lower temperatures prevail during the combustion of alcohol-air and octane-water-air than with octane-air mixtures, when full advantage is taken of the heat of vaporization of alcohol and water. Max. temperatures during combustion give no indication regarding pre-ignition. There is no reason why water injection alone should be more beneficial than the injection of an alcohol-water mixture with the identical amount of water.

2604 536.717

***P-V-T-x* relations of the system propane-isopentane.** VAUGHAN, W. E., AND COLLINS, F. C. *Industr. Engng Chem.*, 34, *pp.* 885–890, *July*, 1942.—An experimental study was made of the *P-V-T-x* relations of 5 mixtures of propane and isopentane in the ranges 0° to 300°C. and 2 to 80 atm. The 2-phase and the critical regions are defined.

See Abstr. 2608 536.75 : 536.782

2605 536.75 : 621.165 = 3

Determination of the condition line in turbines by the increase in entropy. ZWEIFEL, O. *Schweiz. Arch. angew. Wiss. Techn.*, 8, *pp.* 28–33, *Jan.*, 1942.—[Abstr. 1301 B (1942)].

See Abstr. 2673 536.753 : 541.123.1

See Abstr. 2541 536.76 : 536.581 : 532.62

2606 536.77

Sources of thermodynamic data. Methods of application to the industry. ASTON, J. G. *Industr. Engng Chem.*, 34, *pp.* 514–521, *May*, 1942.—The most useful equations are given for methods of obtaining free-energy data for a reaction, with an estimate of the accuracy required in the primary data. The methods are applied to the hydration of ethylene and to the isomerization reaction, *n*-butane → isobutane.

2607 536.77 = 3

Remark on the Duhem–Margules equation. FISCHER, V. *Ann. Phys., Lpz.*, 40, 8, *pp.* 628–629, 1941.—Two expressions are given satisfying the Duhem–Margules equation for binary mixtures for any function of the mol. conc. of a component. An example illustrates their use. H. G. S.

See Abstr. 2613 536.775 : 537.322 : 541.136.24 : 537.221

See Abstr. 2612 536.775 : 541.136.1 : 537.221

2608 536.782 : 536.75

Phase equilibria in hydrocarbon systems. BUDENHOLZER, R. A., BOTKIN, D. F., SAGE, B. H., AND LACEY, W. N. *Industr. Engng Chem.*, 34, *pp.* 878–882, *July*, 1942.—Joule–Thomson coeff. of 3 mixtures of methane and propane were determined experimentally at pressures up to 1 500 lb./in.^{2} between 70° and 310°F. From these data, and published heat-capacity values for the components at inf. vol., the isothermal enthalpy/pressure coeff. were calculated. From these derived values the partial enthalpies of methane and propane in mixtures of the 2 substances were established.

2609 536.791

Third law of classical thermodynamics. CROSS, P. C., AND ECKSTROM, H. C. *J. Chem. Phys.*, 10, *pp.* 287–291, *May*, 1942.—A mathematical derivation of alternative statements of the third law derived from its expressions for any real phase and for any spontaneous isothermal process. The completeness

of the expression as a usable postulate for the further development of classical thermodynamics is briefly discussed. N. M. B.

ELECTRICITY. MAGNETISM

2610 537.122 : 537.21

Vibratory electron in electrostatics. Jones, E. T. *Phil. Mag.*, 33, *pp.* 519–527, *July*, 1942.—In an asymmetrical system of 3 stationary electrons there are 4 different energy values associated with its different electrical states, but only 3 common frequencies. This discrepancy is considered by examining the case of 3 electrons forming an equilateral triangle, the electron at the vertex being displaced along a line parallel to the base. The mutual energy of 3-electron systems cannot be calculated accurately on the assumption that electronic interaction is entirely governed by Coulomb's law, but in many cases the electrons experience fluctuations between modes of vibration with different frequencies, some of these modes affecting only 2 of the particles. It is also shown that a stationary doublet cannot become coupled with one or more electrons which would have the effect of decreasing the energy of the doublet. [See Abstr. 1264 (1941)]. A. J. M.

See Abstr. 2610 537.21 : 537.122

2611 537.221 : 537.311.33

On the electrification of dielectrics by friction. Frenkel, J. *J. Phys., U.S.S.R.*, 5, 1, *pp.* 25–29, 1941.—If crystalline dielectrics can be treated as electronic semi-conductors at a low temperature, the electrification of 2 such dielectrics in contact with each other can be described in the same way as the electrification of 2 semi-conductors. Contact electrification can take place only as a result of a local and temporary heating near the contact surface. Friction ensures such a heating.

2612 537.221 : 541.136.1 : 536.775

Contact potentials. III. Voltaic cell. Chalmers, J. A. *Phil. Mag.*, 33, *pp.* 496–505, *July*, 1942.—The general principles laid down in Part I [Abstr. 2348 (1942)] are applied to the voltaic cell. It is pointed out that the electrode potentials of electrochemistry are neither internal nor external p.d.'s. The Nernst conception of solution pressure and the Gibbs–Helmholtz equation are also briefly discussed. A. J. M.

2613 537.221 : 541.136.24 : 536.775 : 537.322

Contact potentials. IV. Concentration cell. Chalmers, J. A. *Phil. Mag.*, 33, *pp.* 506–513, *July*, 1942.—The results for the voltaic cell [see Abstr. 2612 (1942)] are applied to the concentration cell, giving the usual formula. The concentration cell is discussed in connection with the Gibbs–Helmholtz equation. The Peltier and Thomson effects are extended to cover metal-electrolyte and liquid junctions, and results are obtained for a concentration thermojunction which show the existence of a law of intermediate concentrations, but not a law of intermediate metals. A. J. M.

See Abstr. 2536 537.222 : [532.13 + 539.374

2614 537.222.1 = 3

Electrostatic charges as problem in the electronics of metals. Wolf, F. *Ann. Phys., Lpz.*, 41, 2, *pp.* 103–116, 1942.—The depth of penetration of the electrostatic charge on a conductor, assumed to be a solid metal sphere, is investigated. The determination of the potential distribution is carried out on lines similar to the treatment of the electron centrifuge [Abstr. 1640 (1941)] and the electron gas subject to gravity [Abstr. 1910 (1941)]. The potential is not const. over the whole sphere with spatial charge; it increases somewhat towards the centre. The distribution of the spatial charge falls off very approx. in an exponential manner from the surface of the sphere towards the centre, and the steepness of the drop is very great. For Cu the total quantity of electricity with the greatest possible charge resides in a layer on the surface of the thickness of about 16 Å, i.e. in about 4 elementary cells of the Cu lattice. The results obtained, it is stated, can be qualitatively extended to conductors of other shapes. For thin metal films of decreasing thickness the density of the charge is the same as for solids and is independent of the thickness, in accordance with electrostatics. The only change is that with decreasing thickness the charge is compressed more and more, and, assuming a Cu film, would probably not exceed 1/1 000 of the charge of the conduction electrons proper of the metal. H. G. S.

2615 537.226.2 : 541.67

The dielectric investigation of polypeptides. I. The dielectric increments of amino acid polypeptides. Conner, W. P., Clarke, R. P., and Smyth, C. P. *J. Amer. Chem. Soc.*, 64, *pp.* 1379–1387, *July*, 1942.—An apparatus employing the twin-T circuit was used to measure, in the 10 m. wavelength region, the dielectric const. of aq. solutions of 12 amino acid polypeptides. The increment values obtained are in agreement with those previously determined. The effect of mol. vol. upon the apparent increment values is investigated and a method of correction developed for the effect of the solvent when the solute molecules approximate prolate spheroids in shape. In the various di- and tripeptides investigated, the principal effect of side chains upon the mol. dipole moments is that of modification of the solvent effect.

See Abstr. 2611 537.311.33 : 537.221

See Abstr. 2692 537.311.33 : 541.133

2616 537.312.6 = 3

On the anomaly of the electrical resistance of chromium. Addendum to investigations by H. Söchtig. Erfling, H. D. *Ann. Phys., Lpz.*, 41, 2, *pp.* 100–102, 1942.—Temperature/resistance measurements with 2 samples of tempered Cr (pure and impure) testify to the improbability of residual H_2 as the cause of the Bridgman anomaly [Abstr. 2553 (1933)], and Söchtig's explanation of the anomaly on the grounds of the special electron configuration of the Cr atom [Abstr. 1699 (1941)] receives no support from tests with Nb (same outer electron configuration of the atom as Cr) over the temperature range −195° to + 50°C., as no anomaly was exhibited. H. G. S.

2617 537.312.62 : 538.542 = 3

Experiments on the branching of currents and skin effect in supra-conductors. Justi, E., and Zickner, G. *Phys. Z.*, 42, 15–16, *pp.* 257–273, *Sept.*, 1941.—The v. Laue theory [Abstr. 725 (1933)] is subjected to experimental proof. The principle of the deter-

mination of the currents in the branches without opening the supra-conducting circuits is explained, and a description is given of the Sn and Pb coils and apparatus used, the measurements of the self and mutual inductances of the coils and of the current branching between 2 of the Sn coils, 2 of the Pb coils, and between one Sn and one Pb coil for both + and − mutual induction. The error limits of the apparatus are discussed. With $L_{11} > L_{12} > L_{22}$ the current in the larger of the 2 coils flows uphill, opposed in sense to the total current. The departure from the theoretical min. of the magnetic energy calculated from the test data is under 1%. The current branching is independent of the current strengths and superimposed currents. A current flowing prior to supra-conduction is entirely confined to the outer coil when supra-conduction sets in. This is explained as due to the rapid cooling of the outer coil and the correspondingly rapid drop in its resistance and consequent freezing-in of its current paths. This thermal outer cooling effect leads to a suppression of the magnetic field similar to that in the Meissner–Ochsenfeld effect. It is pointed out that the formulae for the current branching afford an explanation of the skin effect with d.c. when supra-conduction sets in. H. G. S.

2618 537.312.8 : 536.21 : 548 = 3

Further investigations with Be crystals in the transverse and longitudinal magnetic field. Erfling, H. D., and Grüneisen, E. *Ann. Phys., Lpz.*, 41, 2, *pp.* 89–99, 1942.—A continuation of earlier work [Abstr. 2615 (1938), 578 (1940) and 1861 (1941)]. Measurements are made of the sp. electrical and thermal resistance of a Be II crystal in the transverse field up to 12 200 oersted, and at − 183° and − 194°C. From the results the Wiedemann–Franz–Lorenz number and its change in different fields are calculated. The Kohler relation is found to hold. The electrical resistance tests in the transition from the longitudinal to the transverse field at − 183° and − 194°C. show that with both Be I and Be II the field effect is a max. with the crystal and the field at rt. angles or in 2 neighbouring portions (± 16°), whereas when parallel the effect is weak. The max. field effect grows strongly and rapidly with the field strength, the min. only little. Analogous measurements of the thermo-electric power yield max. changes with the field direction transverse, and little effect with the test-piece and field parallel. At the max. the curve of field dependence rises strongly but slowly, whereas at min. the rise is small and appears in part to take place in steps. H. G. S.

2619 537.32 : 538.639 : 548 = 3

Investigations on the electrical and thermal phenomena in the magnetic field with special consideration of the question of the reversibility of the thermo-electric effect. Kohler, M. *Ann. Phys., Lpz.*, 40, 8, *pp.* 601–627, 1941.—A generalized treatment of the electrical and thermal effects in metal crystals in the magnetic field on the basis of the electron theory of metals. The fundamental equations are derived for the electrical and thermal current density in the magnetic field and deductions made on the electrical and thermal resistance and the thermo-electric phenomena in the field. The change in entropy in the conductor by the conduction processes is calculated quantum-statistically [see Abstr. 919 (1940)]. The Wiedemann–Franz law in the magnetic field [Abstr. 2616 (1938)] is also obtained, but on more general premises. The phenomena in metal crystals with disappearing magnetic field are dealt with. Formulae are given for the a.c.-d.c. effect and the electric after-effect. Values of the former are determined for various hexagonal and trigonal metals. A classification of the galvano-magnetic and thermo-magnetic effects in crystals is given. Of fundamental importance is the division into direct and indirect effects. The reversibility of the thermo-electric phenomena in the magnetic field is considered. The 2nd Thomson relations are shown to hold rigidly for the direct thermo-magnetic effects and can therefore be regarded as reversible in the sense in which the thermo-electric are reversible in the disappearing magnetic field. For the actual Ettingshausen and Ettingshausen–Nernst effects (to which the indirect thermo-e.m.f. and the indirect Peltier effect belong) the 2nd Thomson relations hold with reversed sign. These effects contribute to the entropy balance and must be regarded as reversible. H. G. S.

2620 537.32 : 538.639 : 548 = 3

Remarks on the sign of the transverse thermo-magnetic effect in the case of the free electron gas. The transverse Thomson effect in anisotropic metals and the analogous phenomena in the magnetic field. Kohler, M., *Ann. Phys., Lpz.*, 41, 1, *pp.* 54–60, 1942.—The sign of the E.–N. (Ettingshausen–Nernst) coeff. for the free electron gas is further investigated. It depends on that of $A' = (d \log \tau / d \log E)_{E=\zeta_0}$ (where τ = impulse time for the electrons dependent on the energy E, and ζ_0 = Fermi limiting energy at absolute zero). For the single-valued rare metals A' is neg. and, consequently, the E.–N. effect also. For the alkali metals a + E.–N. effect is to be expected, Li excepted. In the 2nd section the transverse Thomson effect in metal crystals is considered, both with disappearing magnetic field and with a field present. H. G. S.

See Abstr. 2613 537.322 : 541.136.24 : 536.775 : 537.221

2621 537.363

The effect of urea on the electrophoretic patterns of serum proteins. Moore, D. H. *J. Amer. Chem. Soc.*, 64, *pp.* 1090–1092, *May*, 1942.—Electrophoretic patterns giving a large number of components for human serum in the presence of 2·8 *M* urea have been shown to be a result of convection currents in the electrophoresis cell. The change of density with temperature for a urea solution of this conc. is comparatively large in the region of 0° to 4°.

2622 537.364 : 621.317.31.021 : 621.319.7

Electrical charges produced by flowing gasoline. Mackeown, S. S., and Wouk, V. *Industr. Engng Chem.*, 34, *pp.* 659–664, *June*, 1942.—[See Abstr. 1385 B (1942)].

2623 537.521.7 : 621.3.015.5

The mechanism of the electric spark. Zeleny, J. *J. Appl. Phys.*, 13, *pp.* 444–450, *July*, 1942.—[Abstr. 1305 B (1942)].

2624 537.525.2

Total secondary electron emission from thin films of sodium on tungsten. McKay, K. G. *Phys. Rev.*, 61, *pp.* 708–713, *June* 1 *and* 15, 1942.—The secondary emission yield has been determined for thin films of Na on a polycrystalline W base and compared with that obtained for a clean W target over a range of primary electron energies of 100 to 1 200 V. The yield showed a systematic increase as the work function of the surface was decreased by the addition of Na. The work function was increased by forming an air film on a clean W surface and the secondary emission was shown to decrease.

2625 537.525.83

Current density at the cathode of a glow discharge through gases. Chaudhuri, R. M. *Curr. Sci.*, 11, *pp.* 188–189, *May*, 1942.

See Abstr. 2559 537.531 : 535.23.08 : 621.386.8 : 615.84

2626 537.531 : 535.3

***K*-emission spectra of Si and C from SiC.** Gupta, K. Das. *Sci. and Cult.*, 7, *p.* 614, *June*, 1942.—[See Abstr. 2993 (1940)].

2627 537.531 : 535.3 = 3

The mass absorption, photo-electric absorption and scattering coefficients of monochromatic X-rays from Ni (28), Cu (29), Ag (47), Cd (48), Sn (50), Ta (73), W (74), Ir (77), Pt (78), Au (79) and Pb (82). Lauber, S. *Ann. Phys., Lpz.*, 40, 8, *pp.* 553–578, 1941.—An accurate determination is made of the mass absorption coeff. μ/ρ of the elements cited in the title. The Küstner filter-difference method [Abstr. 3847 (1931)] is used. With the plot of log μ/ρ in dependence on logλ a straight line, the scattering coeff. σ/ρ can be regarded as negligible compared with μ/ρ, and $\mu/\rho \sim \tau/\rho = C\lambda^n$ holds. The exponent n decreases with increasing atomic number within the limits of the errors of measurement. The Rindfleisch law of the *K*-absorption jumps, $\mu_K/\mu_I = 7{\cdot}2053\ \lambda^{0{\cdot}2843}$ [Abstr. 2150 (1937)] is confirmed. The laws $\tau/\rho = C\lambda^n$ and $\sigma_o/\rho = (Z/A) \times 0{\cdot}3973 \leqslant 2$ (hydrogen excepted) for the photo-electric absorption and scattering coeff. are valid, also σ/ρ decreases both with the wavelength and the atomic number within the variations of Z/A. The author's results are discussd in conjunction with those of the observers mentioned in the 44 references in the bibliography. H. G. S.

2628 537.531 : 535.3 : 548

A method of calculating the integral breadths of Debye–Scherrer lines. Stokes, A. R., and Wilson, A. J. C. *Proc. Camb. Phil. Soc.*, 38, *pp.* 313–322, *July*, 1942.—It is shown that, for crystals of the cubic system, the reciprocal of the integral breadth of a Debye–Scherrer line is cos $\theta/\lambda \times$ the vol. average of the thickness of the crystal measured at rt. angles to the reflecting plane. The result is applied to calculate the integral breadths of reflections from crystals having the external forms of rectangular parallelepipeds, tetrahedra, octahedra and spheres. Except for spheres, the integral breadths are a function of the indices of reflection as well as of the size of the crystal and the angle of reflection. For cubes the variation with indices of reflection is about 15%.

See Abstr. 2659 537.533.72 : 539.216.1

See Abstr. 2666 537.533.72 : 539.27

2629 537.533.73 : 539.166.2 : 539.172

Disintegration schemes of radioactive substances. III. I^{131}. Downing, J. R., Deutsch, M., and Roberts, A. *Phys. Rev.*, 61, *pp.* 686–691, *June* 1 *and* 15, 1942.—The disintegration of the 8-day isotope of iodine, I^{131}, has been studied by spectrometer and coincidence techniques. The β-ray spectrum is simple and has an end point of $0{\cdot}595 \pm 0{\cdot}01$ eMV. Each β-ray is accompanied by 2 cascade γ-rays of energies 367 ± 7 and 80 ± 1 ekV, respectively. Both γ-rays are partially internally converted, the 367 ekV γ-ray in the *K* shell in 0·8% of the disintegrations. [See Abstr. 188 (1942)].

See Abstr. 2660 537.533.73 : 539.216.1

See Abstr. 2719, 2720 537.533.73 : 541.6

2630 537.533.79 : 77

The photographic action of electrons in the range between 40 and 212 kilovolts. Baker, R. F., Ramberg, E. G., and Hillier, J. *J. Appl. Phys.*, 13, *pp.* 450–456, *July*, 1942.—The Hurter and Driffield curves and the absolute sensitivities of Eastman medium lantern slide plates are determined for electrons accelerated through p.d.'s from 40 to 212 kV. Within experimental error the H and D curves are identical in shape for the different voltages. The sensitivity reaches a peak near 100 kV and then drops off rapidly. This phenomenon may be utilized to increase the effective sensitivity of plates at h.v. by applying a thin, high-density intensifying screen to the surface of the emulsion.

2631 537.533.8 = 3

On the properties of the yield and energy distribution of secondary electrons from films of increasing thickness. Geyer, K. H. *Ann. Phys., Lpz.*, 41, 2, *pp.* 117–143, 1942.—The yield and energy distributions of the secondary electrons from MgF_2 and NaCl films varying in thickness from 1–1 000 d (d = lattice plane spacing) and deposited on Ni plates as bases are measured by the central-field and homogeneous-field methods and the results represented in a series of curves. Below 10–30 d the yield increases steadily without change of position of the max. of the curve. This is explained by the loss in velocity of the primary electrons in the film, the secondary electrons coming mainly from the metal base. Between 10 and 30 d the position of the max. yield changes in the direction of the higher voltages and strong field emission occurs, pointing to films below 10 d having the imposed structure of the base, those above 30 d an amorphous structure. With infra-red irradiation the yield of films about 300 d in thickness can be raised, owing to the resulting improved conductivity, but at 1 000 d an increased yield no longer obtains. The length of path of the primary electrons in the film is therefore 300–1 000 d. With films of 10 d the slowest secondary electrons are represented by greatest and the back-diffusing primary electrons and the more rapid secondary electrons of 30 V by least intensity in the energy distribution curves, which, for films of 600–1 000 d, indicate a series of max. with which the supposed selectivities in the passage of the slow electrons through periodic potential lattices can be associated. 29 references are given.

H. G. S.

See Abstr. 2645 537.591 : 539.16.08

2632 537.591 : 550.38

Electric and magnetic effects of cosmic rays. EVANS, F. *Phys. Rev.*, 61, *pp.* 680–683, *June* 1 *and* 15, 1942.—Slow interstellar electrons, moving in the vicinity of the earth under the influence of a radial electric field, caused by the earth's interception of cosmic rays, and the magnetic field of the earth's dipole, will produce a continuous series of shell currents concentric with the earth. The current density in the shells varies with the inverse 5th power of the distance from the earth's centre and the cosine of the latitude. These currents contribute to the earth's field a uniform component parallel to the magnetic axis in a direction from S. to N. If either cosmic-ray intensity or the density of positive ions in the vicinity of the earth varies, a variation in magnetic field intensity at the earth's surface follows. The ratio $(\Delta I/I)/(\Delta H/H)$, where I represents cosmic-ray intensity and H the horiz. comp. of the earth's magnetic field, is of the same order of magnitude as observed experimentally.

2633 537.591.1

Nature of the soft component of cosmic rays at 3 500 metres altitude. AUGER, P. V. *Phys. Rev.*, 61, *pp.* 684–685, *June* 1 *and* 15, 1942.—An interpretation is given for the absorption curves of cosmic rays obtained with screens of different atomic numbers. Measurements made in 1935 at the Jungfraujoch (3 500 m.) with Pb and Al show the existence of an important number of mesons of relatively small energy in the soft component.

2634 537.591.15

Investigation of transition curves with the anti-coincidence method. SPIVAK, P. *J. Phys., U.S.S.R.*, 5, 1, *pp.* 5–14, 1941.—An investigation of the transition effect in lead with the anti-coincidence method has been carried out. Showers passing round the screen and showers produced at its edges form a considerable part of the number of coincidences observed for great thicknesses of the screen. Showers from the edges were eliminated by shading counters. Background determination and measurements of the non-ionizing particles transition curve have been carried out with the anti-coincidence method with the help of a block of counters placed above the screen. The altitude dependence of the frequency of showers observed for thick layers of a lead screen corresponds to the increase of intensity of the hard component of cosmic rays; these showers are produced by the penetrating ionizing particles.

See Abstr. 2642 537.591.15 : 539.152.1

2635 537.591.2

Further measurements of the mesotron lifetime. ROSSI, B., GREISEN, K., STEARNS, J. C., FROMAN, D. K., AND KOONTZ, P. G. *Phys. Rev.*, 61, *pp.* 675–679, *June* 1 *and* 15, 1942.—The average ranges before decay of 2 mono-energetic mesotron groups have been measured. Within the statistical errors, the ranges are found to be in the same ratio as the average effective momenta, as theoretically predicted. From the measurements, and with a mesotron mass $\mu = 10^8\ \mathrm{eV}/c^2$, one obtains the values $\tau_0 = (2{\cdot}8 \pm 0{\cdot}3) \times 10^{-6}$ and $\tau_0 = (2{\cdot}9 \pm 0{\cdot}7) \times 10^{-6}$ second for the proper lifetime of mesotrons, in agreement with previous measurements by Rossi and Hall. [Abstr. 883 (1941)].

See Abstr. 2558 537.591.5 : 535.14

2636 538 : 621.318 : 9

Joseph Henry, pioneer in space communication. MAGIE, W. F. *Proc. Inst. Radio Engrs, N.Y.*, 30, *pp.* 261–266, *June*, 1942.

2637 538.221

Ferromagnetic gold-iron alloys. PAN, S. T., KAUFMANN, A. R., AND BITTER, F. *J. Chem. Phys.*, 10, *pp.* 318–321, *June*, 1942.—Magnetic measurements were made on a Au-Fe alloy containing 37 atom. % Fe, both in the quenched and successively annealed states. The quenched super-saturated solid solution is ferromagnetic. When this solution was gradually heated up, perceptible precipitation took place at about 450° C. Both the final Au-rich and Fe-rich phases precipitated at 450°C. were magnetic at room temperatures. The mechanism of precipitation is mainly non-uniform.

See Abstr. 2617 538.542 : 537.312.62

See Abstr. 2514 538.551.25 : 534.1 : 517.941.9 : 621.316.7

2638 538.565 : 621.392.42

The use of vacuum tubes as variable-impedance elements. REICH, H. J. *Proc. Inst. Radio Engrs, N.Y.*, 30, *pp.* 288–293, *June*, 1942.—[Abstr. 1408 B (1942)].

2639 538.615 : 535.338.3

First spark spectrum of thorium—classification and Zeeman effect data of Th II. MCNALLY, JR., J. R., HARRISON, G. R., AND PARK, H. B. *J. Opt. Soc. Amer.*, 32, *pp.* 334–347, *June*, 1942.—Five sets of exposures to the Th arc in Ag, burning in a Bitter electromagnet at fields up to 93 000 oersteds, have given resolved Zeeman patterns for more than 800 lines of Th II. Data obtained from these plates, measured with an automatic comparator and used in connection with improved wavelength measurements, have made possible classification of 1 091 lines of Th II as arising from 219 levels. These levels belong to two groups of terms between which no combinations have been found.

See Abstr. 2619, 2620 538.639 : 548 : 537.32

2640 538.652 = 3

On the influence of the magneto-elastic energy on the asymptotic law of the magnetostriction and magnetization curve of iron. II. The magnetostriction and magnetization of iron in strong fields with consideration of the true magnetization. III. RÜDIGER, O., AND SCHLECHTWEG, H. *Ann. Phys., Lpz.*, 41, 2, *pp.* 144–166, 1942.—The law established in the earlier work [Abstr. 1671 (1941)] for the longitudinal magnetostriction is reconsidered by including the effect of the magneto-elastic energy which was then neglected. The result shows that the obtained corrections are insignificant. In very strong fields the magnetostriction does not tend to a saturation value, but grows linearly with the field, the growth being attributable to volume magnetostriction and thus to true magnetization. H. G. S.

MOLECULAR AND ATOMIC PHYSICS

2641 539.133

The dipole moment of a free radical. TURKEVICH, J., OESPER, P. F., AND SMYTH, C. P. *J. Amer. Chem. Soc.*, 64, *pp.* 1179–1180, *May*, 1942.—The dipole moments of α,α-diphenyl-β-picrylhydrazine and of the free radical, α,α-diphenyl-β-picrylhydrazyl, have been measured. The increase in the moment of the hydrazine over those of the phenyl hydrazines shows resonance with large contributions from polar structures. The further increase in the moment of the free radical over that of the hydrazine corresponds to the increased resonance among polar structures which stabilizes the free radical.

See Abstr. 2590 539.133 : 536.63

See Abstr. 2693 539.133 : 541.133

2642 539.152.1 : 537.591.15 = 3

Scattering of mesons taking damping into account. SOKOLOW, A. *J. Phys., U.S.S.R.*, 5, 4, *pp.* 231–237, 1941.—Quantum-mechanical methods are used to calculate the effective cross-section for the scattering of mesons at nuclons, taking damping into account.

A. J. M.

See Abstr. 2723 539.152.1 : 541.621

2643 539.153 = 3

Contributions to the aromatic problem. II. The density distribution and zero-point energy of the *B*-electrons of aromatic substances. SCHMIDT, O. *Phys. Z.*, 42, *pp.* 307–319, *Oct.*, 1941.—The discussion [Abstr. 2153 (1941)] is extended to the lower members of the graphite-benzol series. From the density distribution of the *B* electrons the diamagnetic anisotropy is calculated and the mechanism of the cancer-producing aromatic molecules discussed. Besides the wave-mechanical method of investigation, the perturbation method [Abstr. 3352 (1931)] is referred to, and the graphical method [Abstr. 2114 (1933)] is briefly considered. 51 references are given. See also Abstr. 2730 (1941)]. H. G. S.

2644 539.16.08

Some operating characteristics of the Wilson cloud chamber. HAZEN, W. E. *Rev. Sci. Instrum.*, 13, *pp.* 247–257, *June*, 1942.—The following characteristics were studied: (*a*) the dependence of min. pressure on expansion time, (*b*) the ion threshold expansion ratio as a function of expansion time, (*c*) the sensitive time and its dependence on the percent expansion, (*d*) the rate of pressure rise after completion of a fast expansion, and (*e*) the rate of drop growth in N_2, H_2 and He with vapour from 95% C_2H_5OH or a liquid mixture of 1 part H_2O to 3 parts C_2H_5OH. The experiments were performed with cloud chambers 30 cm. dia. × 10–30 cm. depth filled, in most cases, with N_2 as the permanent gas and with the vapour from a 1 : 3 liquid mixture of H_2O and C_2H_5OH. (*a*) The min. pressure is $\propto \sqrt{}$ (expansion time). (*b*) The ion threshold expansion ratio increases linearly with expansion time. (*c*) The sensitive time increases with expansion ratio, reaches a max. when the general background becomes appreciable, and approaches 0 for higher expansion ratios. (*d*) The initial pressure rise after completion of an expansion is $\propto \sqrt{}$ (time). (*e*) The surface area of a drop increases linearly with time in all cases. The temperature of a drop calculated from the rate of growth and from thermal constants is much lower for H_2 and He than for N_2.

2645 539.16.08 : 537.591

A complete proportional counter arrangement for cosmic-ray measurements. WEISZ, P., AND RAMSEY, W. E. *Rev. Sci. Instrum.*, 13, *pp.* 258–264, *June*, 1942.—The analysing chamber is a carefully designed proportional counter tube filled with purified argon. The control is accomplished by a system of Geiger–Müller counters operating as a conventional telescope which "turns on" the amplification and recording mechanism for a period of time beginning with the passage of the ray and ending approx. 4×10^{-4} sec. later. During this time the amount of charge released in the proportional counter by this ray, and only this ray, is recorded.

2646 539.162

On the theory of successive radioactive transformations. SEDGWICK, W. F. *Proc. Camb. Phil. Soc.*, 38, *pp.* 280–289, *July*, 1942.—Furnishes simple algebraical proofs of the general formulae for the number of particles, at any time *t*, of the *r*th product in a series of successive radioactive transformations. This is done both for "Case 1," where the matter is initially all of one kind, including a stable end-product, and for "Case 2," where the successive products are initially all in existence and in equilibrium. There exists a relation between the amounts of the end-product in "Case 1," supposed to be the $(r + 1)$th product, and of the preceding *r*th product in "Case 2," for the same time *t*.

2647 539.163

The radio-elements in non-equilibrium systems. URRY, W. D. *Amer. J. Sci.*, 240, *pp.* 426–436, *June*, 1942.—An equation is derived for the relative amounts of the long-lived members of the U-238 series at any time prior to the establishment of radioactive equilibrium. The equation is general for any succession of 3 radio-elements.

See Abstr. 2629 539.166.2 : 539.172 : 537.533.73

2648 539.166.8

Experimental evidence for the existence of a neutrino. ALLEN, J. S. *Phys. Rev.*, 61, *pp.* 692–697, *June* 1 *and* 15, 1942.—Radioactive Be^7 was deposited on a Pt foil by a new evaporation technique. An electron multiplier tube was employed to count the recoil nuclei produced in the reaction, $Be^7 + e_K \rightarrow Li^7 + \eta + Q$. The max. energy of the recoils was about 40 to 45 eV, compared with the value of 58 eV to be expected. The observed coincidences were $< 2\%$ of those expected for γ-ray recoils.

2649 539.17 : 621.384

The use of elkonite for cyclotron ion sources. CURTIS, B. R., AND BENDER, R. S. *Rev. Sci. Instrum.*, 13, *p.* 266, *June*, 1942.

See Abstr. 2629 539.172 : 539.166.2 : 537.533.73

2650 539.172 : 621.384 : 621.319.33

A high-voltage apparatus for atomic disintegration experiments. CRAGGS, J. D. *Proc. Phys. Soc., Lond.*, 54, *pp.* 439–456, *Sept.*, 1942.—[See Abstr. 1382 B (1942)].

2651 539.172.4 : 541.6

Reactions of bromine with carbon tetrachloride and tetrachlorethylene following neutron capture and isomeric nuclear transition. BOHLMAN, E. G., AND WILLARD, J. E. *J. Amer. Chem. Soc.*, 64, *pp.* 1342–1346, *June*, 1942.—The nuclear n,γ process whereby radioactive Br is produced is capable of causing reaction of the Br with CCl_4 in solution but little or no reaction occurs in the gas phase. An appreciable fraction of the organic bound radiobromine resulting from both the isomeric-transition and neutron-capture reactions is in compounds of higher b.p. than CCl_3Br. This indicates that the mechanism of reaction involves a disruption of the CCl_4 molecule more serious than the removal of a single Cl atom.

2652 539.185

The spectra of photoneutrons (RaTh + Be) and (Ra + Be). GOLOBORODKO, T. A. *J. Phys., U.S.S.R.*, 5, 1, *pp.* 15–18, 1941.—It is found by filtration through paraffin layers of different thickness that photoneutrons (RaTh + Be) are monochromatic and possess an energy of about 0·85 eMV. Scattering cross-sections measured with photoneutrons of 0·1 and 0·5 eMV differ considerably for silicon.

2653 539.185

A photographic plate spectrum of the neutrons from the disintegration of lithium by deuterons. RICHARDS, H. T. *Phys. Rev.*, 59, *pp.* 796–804, *May* 15, 1941.—The energy spectrum of the neutrons from Li + H^2 has been studied by the photographic emulsion technique. Confirmation is given of the broad 10·8 eMV neutron group reported by Stephens from He recoil data. Reasons are given for believing that not all the neutrons from this group correspond to the 2·8 eMV excitation level in the residual Be^8 nucleus. Evidence is also given for at least 2 higher (7·5 eMV and 10 eMV) levels in Be^8. A discussion of the photographic emulsion technique is included, and a correction is calculated for the differing probability that long tracks be acceptable for measurement. The stopping power of the emulsion for 3 different proton energies was found.

2654 539.185

Spectra and energy of photoneutrons (RaTh, Be) and (Ra, Be). GOLOBORODKO, T. A. *J. Phys., U.S.S.R.*, 5, 1, *pp.* 19–23, 1941.—The spectrum of photoneutrons (RaTh + Be) and (Ra + Be) was studied by filtration through layers of paraffin. Neutrons of the first reaction are monochromatic, with a small amount of photoneutrons formed by the 3 weak lines of the γ-spectrum RaThC″. Their energy is about 0·45 eMV. Photoneutrons of the second reaction are composed principally of 2 groups with energies of 0·1 and 0·25 eMV. There is apparently a weak line with an energy of the order of 3 eMV in the spectrum of the γ-rays RaC.

2655 539.185 : 548

The effect of long-range order in alloys upon the scattering of slow neutrons. SMIRNOV, A. A., AND VONSOVSKY, S. V. *J. Phys., U.S.S.R.*, 5, 4, *pp.* 263–266, 1941.—Theoretical. Consideration is restricted to neutrons of which the velocity is so low that only elastic scattering at the nucleus is involved. J. T.

2656 539.214

Loss of plasticizers from polyvinyl chloride plastics in vacuum. LIEBHAFSKY, H. A., MARSHALL, A. L., AND VERHOEK, F. H. *Industr. Engng Chem.*, 34, *pp.* 704–708, *June*, 1942.—Van der Waals forces between plasticizer and polyvinyl chloride molecules make plastic the polyvinyl chloride by separating from one another the chain molecules of which the latter is composed. As plasticizer is removed, the van der Waals forces among the chains bring them closer together; thus it becomes more difficult for the remaining plasticizer molecules to get out, and the volume additivity apparently characteristic of these plastics is conserved.

2657 539.214 : 541.8

Effect of solvents upon solid organic plastics. DELMONTE, J. *Industr. Engng Chem.*, 34, *pp.* 764–770, *June*, 1942.—Solvents are classified according to the degree with which they reduce the shear strength of plastics. Complete loss in strength accompanied by formation of a smooth solution identifies a true type A solvent. Non-solvents are classified into 3 groups—those which weaken and swell the plastic, those which only weaken it and those which have no effect. Solvents which exhibit the greatest initial rate of penetration of a solid are also the first to dissolve the plastic completely.

2658 539.215.2 : 77 = 3

Measurements of the graininess and resolving power of photographic films. RAUDENBUSCH, H. *Phys. Z.*, 42, *pp.* 208–212, *Aug.*, 1941.—The oscillograph-photometer used in investigating the micro-transparency fluctuations, and their frequencies, of photographic films is described. With the 9 types of plates tested no connection was found between transparency fluctuation and frequency. The results of the screen tests conducted on the resolving power are given in tables and curves. H. G. S.

2659 539.216.1 : 537.533.72

What information does electron microscopy give concerning the structure of cellulose fibres? WERGIN, W. *Kolloid Z.*, 98, *pp.* 131–139, *Feb.*, 1942.—Previous investigations [Abstr. 2446 (1941)] are discussed and compared with pictures taken with an electrostatic microscope. Structural units of 150 Å for wood and 80–100 Å for ramie were found, which apparently correspond to the micelles and the ordered crystalline ranges of X-ray optics. These units or primary fibrils are joined together to form bundles covered by a skin-like substance of unknown chemical composition. The general structure is described as a multiple set of boxes one outside the other. R. N.

2660 539.216.1 : 537.533.73

Electron microscope observations of collagen. HALL, C. E., JAKUS, M. A., AND SCHMITT, F. O. *J. Amer. Chem. Soc.*, 64, *p.* 1234, *May*, 1942.

2661 539.216.1 : 539.24

Microscopic structure of flax and related bast fibres. HOCK, C. W. *J. Res. Nat. Bur. Stand., Wash.*, 29, *pp.* 41–50, *July*, 1942.—The stem of the flax plant consists of 2 main parts, a central woody core, and a surrounding cortex which contains the bast fibres. The cambium layer lies between these regions. Retting involves a softening of the tissues

to permit separation of the fibres from the other parts of the stem. The cambium layer is attacked first during this treatment, followed later by attack on other thin-walled cells in the cortex. Flax and related bast fibres, such as hemp, jute and ramie, have a similar origin and structure. They are obtained from the stem in the form of long filaments, each of which is made up of cells. Cotton fibres are single plant cells.

2662 539.216.1 : 539.4.015

Elasticity of wool as related to its chemical structure. HARRIS, M., MIZELL, L. R., AND FOURT, L. *J. Res. Nat. Bur. Stand., Wash.*, 29, *pp.* 73–86, *July*, 1942. *Industr. Engng Chem.*, 34, *pp.* 833–838, *July*, 1942.—Wool protein is composed of long, flexible molecular chains. This flexibility appears to be the basis of the "long-range" elasticity. The wool fibre is distinguished from other textile fibres by the presence of covalent disulphide cross-links between these main chains. Rupture of these links by chemical means decreases the strength of the fibre without necessarily affecting the elastic recovery. Rebuilding the covalent linkages largely restores the original properties of the fibre. Wool appears to be analogous to rubber in several respects. Thus the stress/strain, solubility and swelling characteristics are greatly influenced by the extent of cross-linking in the two materials.

See Abstr. 2661 539.24 : 539.216.1

2663 539.26

An X-ray study of the calcium-strontium alloy series. KING, A. J. *J. Amer. Chem. Soc.*, 64, *pp.* 1226–1227, *May*, 1942.

2664 539.26

Structures of complex fluorides. Rubidium hexafluogermanate. VINCENT, W. B., AND HOARD, J. L. *J. Amer. Chem. Soc.*, 64, *pp.* 1233–1234, *May*, 1942.—[See Abstr. 4437 (1939)].

2665 539.26 : 541.6

The significance of the "V" X-ray diffraction patterns of starches. BEAR, R. S. *J. Amer. Chem. Soc.*, 64, *pp.* 1388–1392, *June*, 1942.—Five varieties of the V type of starch X-ray diffraction powder pattern are described, and conditions for the production of these are given. In the study of the V modifications of starch are to be sought important connections between iodine-colour, Schardinger dextrin formation, and the behaviour of starch molecules during the gelatinization process. Relation of these properties to current ideas of straight-, branched-, and helical-chain starch molecules is briefly discussed with reference to the X-ray evidence.

2666 539.27 : 537.533.72

Surface replicas for use in the electron microscope. SCHAEFER, V. J., AND HARKER, D. *J. Appl. Phys.*, 13, *pp.* 427–433, *July*, 1942.—A simple method is described for making replicas of surfaces for study in the electron microscope. The surface is cleaned and coated with a thin, slightly wedge-shaped film of polyvinyl formal having a range in thickness from about 500 to 750 Å in 2·5 cm. A description of the preparation is given. A graph is presented showing the thickness of resin films obtainable from various concentrations of resin in dioxane, and a table gives the interference effects which may be used for determining approx. thicknesses of thin resin films.

ELASTICITY. STRENGTH

See Abstr. 2517 539.31 : 517.948.34

2667 539.374

Plastic flow as an unstable process. DONNELL, L. H. *J. Appl. Mech.*, 9, *A91–A95*, *June*, 1942.—Plastic flow frequently proceeds in a discontinuous manner, as in the formation of wedge-shaped plastic regions around the periphery of torsion specimens. This phenomenon can be explained as an instability, brought about by stress concentrations caused by the discontinuous behaviour of the material around the yield point. Yielding first occurs at some region of local weakness. The lagging of the stress in this yielded region causes a stress redistribution around the region, as if it were a hole, which retards stresses and therefore yielding in certain directions while accelerating them in others, thus leading to the spontaneous growth of characteristically shaped plastic regions.

See Abstr. 2536 539.374 + 532.13] : 537.222

2668 539.374 : 551

The elasticity of glass at high temperatures, and the vitreous basaltic substratum. BIRCH, F., AND BANCROFT, D. *Amer. J. Sci.*, 240, *pp.* 457–490, *July*, 1942.—The elasticity and internal friction of a number of specimens of glass, including 5 of artificially melted diabase glass, have been studied to 600°C. The relationship between rigidity, viscosity and internal friction of glass is considered with particular attention to Maxwell's relaxation theory. The measurements of elasticity of basaltic glasses are reviewed, with the conclusion that the velocities possible in a layer of basaltic glass beginning at a depth of 60 km. would be considerably below the seismic velocities reported for this depth.

See Abstr. 2662 539.4.015 : 539.216.1

See Abstr. 2669 539.4.016.3 : 539.431 : 620.17

2669 539.431 : 539.4.016.3 : 620.17

Correlation of residual stresses in the fatigue strength of axles. HORGER, O. J., AND NEIFERT, H. R. *J. Appl. Mech.*, 9, *A85–A90*, *June*, 1942.—[Abstr. 1297 B (1942)].

2670 539.431.6 : 677

Note on flexural fatigue of textiles. SCHIEFER, H. F., AND BOYLAND, P. M. *J. Res. Nat. Bur. Stand., Wash.*, 29, *pp.* 69–71, *July*, 1942.—Results are given which indicate that the ability of a textile fabric to withstand repeated flexing depends upon the structure of the fabric, the position and structure of the yarn in the fabric, and the kind of fibre from which the fabric is made.

2671 539.433 : 541.26

Mechanical properties of substances of high molecular weight. II. Rigidities of the system polystyrene-xylene and their dependence upon temperature and frequency. III. Viscosities of the system polystyrene-xylene. FERRY, J. D. *J. Amer. Chem. Soc.*, 64, *pp.* 1323–1336, *June*, 1942.—[See Abstr. 687 (1941)].—Solutions of polystyrene in xylene, which in static deformation appear to be viscous liquids with no yield value, support transverse vibrations and therefore possess rigidity. The propagation of transverse vibrations in such solutions has been studied over a conc. range of 15·7 to 52·3% polymer and a

temperature range of − 5° to 40°, betw. 200 and 4 000 c./s. The dispersion of velocity at low conc. and the damping at high conc. are described. The mod. of rigidity varies from 10^4 to 10^6 dyne cm.$^{-2}$ in the range studied. Its decrease with increasing temperature is characterized by a heat effect of 1·5 kcal. The viscosities were studied over a conc. range of 15·4 to 52·3% and a temperature range of 1° to 30°. The viscosity and rigidity data are interpreted in terms of 2 molecular mechanisms, each with a characteristic mod. of rigidity and relaxation function. One of these, in which the mod. of rigidity is ∝ the conc., and the mean relaxation time approx. ∝ the macroscopic viscosity, is tentatively identified with the uncurling of flexible chain molecules. The other, in which the mod. of rigidity is ∝ (conc.)^3, and the relaxation time is independent of conc. (and hence viscosity), is tentatively identified with the bending of C–C bonds.

See Abstr. 2726 539.89 : 541.64

PHYSICAL CHEMISTRY

2672 541.118

Theory of coal pyrolysis. Fuchs, W., and Sandhoff, A. G. *Industr. Engng Chem.*, 34, *pp.* 567–571, *May*, 1942.—It is derived from fundamental principles that aliphatic C–C linkages are the first to break, that C–H linkages are severed next as the temperature of 600°C. is approached and exceeded, and that aromatic C–C linkages do not break readily in the temperature range of coal carbonization, because these linkages have been stabilized by resonance. In the range from 400° to 700°C., oxygen-containing complexes and other heterocyclic structures are breaking away from the coal (or semi-coke) molecules; this process is induced by an activation energy of roughly 32 000 cal. per formula wt. of split product and results in a decrease of free energy. The liberated radicals transform into more stable products, especially aldehydes; these, in turn, decompose to nitrogen bases, phenols, hydrocarbons, carbon monoxide, water and hydrogen.

See Abstr. 2601 541.122 : 536.7

See Abstr. 2542 541.123.012.5 : 532.72

2673 541.123.1 : 536.753

Phase equilibria in hydrocarbon systems. Sage, B. H., and Lacey, W. N. *Industr. Engng Chem.*, 34, *pp.* 730–737, *June*, 1942.—The sp. vol. of *n*-pentane was determined from atm. to 10 000 lb./in.^{2} at 10 temperatures betw. 100° and 460°F. The v.p. was determined at 9 temperatures in this interval, and the volumetric behaviour in the critical region was studied. Enthalpy-pressure coeff. in both the gaseous and liquid regions were calculated. Values of isothermal enthalpy changes and of the fugacity of *n*-pentane were calculated.

2674 541.123.2.034.6

Vapour-liquid equilibria of non-ideal solutions. Utilization of theoretical methods to extend data. Carlson, H. C., and Colburn, A. P. *Industr. Engng Chem.*, 34, *pp.* 581–589, *May*, 1942.—The terminal values of the activity coeff. and the const. of the van Laar equations for a homologous series of alcohols in binary mixtures with water or benzene are shown to progress regularly with increasing mol. wt. The effect of pressure or temperature on the curves of equilibrium liquid and vapour composition may be calculated. Approx. procedures for estimating ternary equilibrium data from those on the 3 binary systems are given. Distribution coeff. may be predicted from the activity coeff.

2675 541.123.2 : 518.4

Interconversions of binary compositions by simple graphical methods. Sun, K. H., and Silverman, A. *Industr. Engng Chem.*, 34, *pp.* 682–684, *June*, 1942.—Two simple graphical methods have been worked out for the interconversion of wt., vol. and mole fractions, and for conversion into these fractions from compositions, expressed in pts. by wt., or otherwise, in a binary system.

2676 541.123.4

Nitromethane – isopropyl - alcohol – water system. Schumacher, J. E., and Hunt, H. *Industr. Engng Chem.*, 34, *pp.* 701–704, *June*, 1942.—The mutual solubility of nitromethane and water and the ternary phase diagram of nitromethane–isopropyl-alcohol–water were determined. The vapour-liquid equilibria data for the binary and ternary systems are also given.

2677 541.123.4 : 518.4

Tie-line correlation. Othmer, D. F., and Tobias, P. E. *Industr. Engng Chem.*, 34, *pp.* 693–696, *June*, 1942.—Ternary solubility data have been plotted, using a new tie-line plot. A straight line results from a plot of log $(1 - a_1)/a_1$ *v.* log $(1 - b_2)/b_2$, where a_1 is the fraction of solvent in the solvent phase and b_2 is the fraction of diluent in the diluent or other phase. This plot and the corresponding equation derived from theoretical reasoning apply even to those systems in which there is considerable miscibility of the solvent and diluent phases; only 2 exp. determined points are required to establish the entire tie line. Only 1 set of co-ordinates is necessary. A simple nomograph on the log plot itself may be used to plot composition data without calculation and then to determine directly the value of the major component of each conjugate phase. From the ternary solubility diagram the values of the other constituents follow immediately.

2678 541.123.4 : 518.4

Partial pressures of ternary liquid systems and the prediction of tie lines. Othmer, D. F., and Tobias, P. E. *Industr. Engng Chem.*, 34, *pp.* 696–700, *June*, 1942.—An equation is derived, relating the partial pressure of the solute in a ternary solubility system to the composition of the mixture. In the 1-phase region of solubility the following equation may be assumed: $P_C = \frac{a}{a+b} f'(C) + \frac{b}{a+b} f''(C)$. Through the use of this equation, of solubility data, and of partial-pressure data for the 2 systems *A-C* and *B-C*, the tie lines of ternary systems may be predicted. Where partial-pressure data are not available, they may be approximated by the use of vapour-composition data and the log plot for v.p.

2679 541.124.7

Detection and inhibition of free radical chain reactions. Smith, J. R. E., and Hinshelwood, C. N.

Proc. Roy. Soc. A, 180, 982, *pp.* 237–256, *June* 5, 1942.—The limiting reductions of the decomposition rates of propaldehyde by NO and of $(C_2H_5)_2O$ by propylene are the same, indicating that the limiting rates are more probably those of independent non-chain processes than those characteristic of stationary states where the inhibitor starts and stops chains with equal efficiency. Differences in the curves for the inhibition of decomposition of $(C_2H_5)_2O$ by NO and by propylene, respectively, are explained. The corresponding curve for propaldehyde decomposition inhibited by propylene is similar to that of the $(C_2H_5)_2O$-propylene system. The influence of propylene and of NO on the thermal decomposition of acetaldehyde is examined and discussed. Results give a picture of the decomposition mechanisms of simple aldehydes indicating that the non-chain reactions depend on a bimolecular collisional activation with superposition of more complex modes with the larger molecules. The chain mechanisms appear to be of two simple types distinguishable by a detailed study of the action of inhibitors. N. M. B.

See Abstr. 2698 541.124.7 : 541.134

2680 541.124.7 : 541.182.6

Exchange of radioactive silver with silver chloride suspensions. LANGER, A. *J. Chem. Phys.*, 10, *pp.* 321–327, *June*, 1942.—From exchange experiments on radioactive Ag in solution with $AgCl_2$ in suspension, it can be shown that the Ag ions in solution are constantly exchanging with the Ag ions in the precipitate. This exchange is not limited to the surface of the crystals, but, probably by means of self-diffusion, is propagated into the precipitate. A steady radioactive state obtains when a homogeneous distribution of the radioactive Ag throughout the whole system is reached. The time necessary to obtain a given fraction of complete exchange for a given amount of precipitate depends strongly on the area of the crystal surface.

2681 541.127

Kinetics and mechanism of 2,6-di-iodotyrosine formation. CHOH HAO LI. *J. Amer. Chem. Soc.*, 64, *pp.* 1147–1152, *May*, 1942.—The rate of 2,6-di-iodotyrosine formation has been studied in acetate buffers at 25° and found to be a bimolecular reaction. A mechanism is proposed for the iodination of phenols. It is shown to be in agreement with the experimental observations.

2682 541.127

Reaction velocity in heterogeneous liquid-liquid systems. KARVE, D. D. *J. Univ. Bombay*, 10, *pp.* 159–166, *March*, 1942.—A survey and discussion, based on available data for mixtures of pairs of immiscible liquids, of various factors affecting reaction velocity, with special reference to the velocity of diffusion of the products and reactants. N. M. B.

2683 541.127

The theory of absolute reaction rates and the conductivity of hydrocarbons at high field strengths. DAVIDSON, N. *Phys. Rev.*, 61, *p.* 721, *June* 1 *and* 15, 1942.—[See Abstr. 633 (1941)].

2684 541.128

Non-peroxide catalysts for the reaction between sulphur dioxide and olefins. MARVEL, C. S., AUDRIETH, L. F., AND SHARKEY, W. H. *J. Amer. Chem. Soc.*, 64, *pp.* 1229–1230, *May*, 1942.

2685 541.128

Influence of external factors in catalytic reactions. SUEN, T. J., CHIEN, T. P., AND CHU, P. S. *Industr. Engng Chem.*, 34, *pp.* 674–676, *June*, 1942.—Two series of experiments on de-hydrogenation of ethyl alcohol were performed. The effect of catalyst bulk was studied in one series and the effect of grain size in the other.

2686 541.128

The mechanism of the catalytic reduction of some carbonyl compounds. ANDERSON, L. C., AND MACNAUGHTON, N. W. *J. Amer. Chem. Soc.*, 64, *pp.* 1456–1459, *June*, 1942.—At low temperatures, the catalytic reduction of acetaldehyde, butyraldehyde, acetone, methyl ethyl ketone and diethyl ketone occurs through addition of H to the carbonyl group in the presence of Ni, Pt and Cu chromite. At elevated temperatures, the reduction occurs through addition of H to the C–C double bond of the enol form. In the presence of Raney Ni, the HD molecule adds to a carbonyl group at low temperatures with preferential formation of the CD and OH bonds. D is exchanged for the hydroxyl H of either isopropyl alcohol or *n*-butyl alcohol in the presence of Ni at 25° and in the presence of Pt at temperatures up to 250°. With Ni or Cu chromite catalysts at 250°, D exchanges for H on both the carbinol C atom and the adjacent C atom of isopropyl alcohol and of *n*-butyl alcohol, indicating that dehydrogenation, enolization and hydrogenation reactions were all involved in these exchanges.

2687 541.128

Catalytic hydrogenation of heptaldehyde in vapour phase. SUEN, T. J., and FAN, S. *J. Amer. Chem. Soc.*, 64, *pp.* 1460–1462, *June*, 1942.—Heptaldehyde was hydrogenated with a Ni catalyst at 250° under atmospheric pressure. A degradation reaction was observed. The main product was found to be *n*-hexane, some *n*-heptyl alcohol also being obtained. The CO formed was partially reduced to methane.

See Abstr. 2600 541.128 : 536.666

2688 541.128 : 541.64

Catalytic polymerization of olefins in the presence of phosphoric acid. FARKAS, A., AND FARKAS, L. *Industr. Engng Chem.*, 34, *pp.* 716–721, *June*, 1942.—The polymerization of isobutene and other olefins was investigated on a phosphoric acid catalyst in which the hydrogen atoms were replaced by deuterium atoms. The mechanisms proposed by various authors for the polymerization are discussed.

2689 541.128.1

Catalytic addition reactions of acetylenic alcohols. HENNION, G. F., AND MURRAY, W. S. *J. Amer. Chem. Soc.*, 64, *pp.* 1220–1222, *May*, 1942.—Acetylenic carbinols have been condensed with methanol to produce a number of substituted dioxanes and with ethylene glycol to form various dioxolanes. Similar reactions with acetic acid yield acyloin acetates.

2690 541.128.1

Catalytic decomposition of hydrogen peroxide by basic beryllium iodide hydrosols. COHEN, B. *J. Amer. Chem. Soc.*, 64, *pp.* 1340–1341, *June*, 1942.—The cata-

lytic effect of the iodide ion sorbed by colloidal BeO is greater than that of the free iodide ion.

2691 541.128.1 : 541.64

Addition polymerization catalysed by substituted acyl peroxides. PRICE, C. C., KELL, R. W., AND KREBS, E. *J. Amer. Chem. Soc.*, 64, *pp.* 1103–1106, *May*, 1942.—The polymerization of styrene and of methyl methacrylate in the presence of *p*-bromobenzoyl peroxide, anisoyl peroxide and chloroacetyl peroxide has yielded polymers with an average of from ½ to 2½ fragments from the peroxide per polymer molecule. These observations are in complete accord with the suggestion that peroxides serve as catalysts for addition polymerization by decomposition to generate free radicals.

See Abstr. 2727 541.128.4 : 541.64

See Abstr. 2699 541.132 : 541.134

See Abstr. 2700 541.132 : 541.8 : 541.134

2692 541.133 : 537.311.33

On the abnormal dependence of the ionic or electronic conductivity of certain solutions on the concentration. FRENKEL, J. *J. Phys., U.S.S.R.*, 5, 1, *pp.* 31–38, 1941.—A number of solutions (oxides of alkali metals in glasses, of alkali metals in liquid ammonia and especially of impure semi-conductors) display a nearly exponential increase of the conductivity with increase of the conc. of the dissolved substance (or impurities). This abnormal behaviour is explained in a general way as a result of a mutual slackening of the dissolved particles as manifested by a steady increase of the dielectric const. of the solution with conc., and an accompanying very rapid increase of the degree of dissociation or ionization.

2693 541.133 : 539.133

Dipole moment and resonance in heterocyclic molecules containing nitrogen and sulphur. OESPER, P. F., LEWIS, G. L., AND SMYTH, C. P. *J. Amer. Chem. Soc.*, 64, *pp.* 1130–1133, *May*, 1942.—The moment of 2-nitrothiophene shows resonance like that in thiophene and in nitrobenzene, the C–N bond having about the same amount of double-bond character as that in nitrobenzene. The small moments of 2-methyl-4,5-diphenyloxazole and benzothiazole are consistent with each other and show resonance with contributions from some of the several polar structures. The moment of N-methylbenzothiazolethione shows that contributions from structures involving polarity in the thiazole ring raise the moment only a little above the large value calculated from the normal group moments. The large moments of 2-mercaptobenzothiazole and 4- and 6-methylmercaptobenzothiazole as compared with the small moment of 2-methylmercaptobenzothiazole show that the former substances exist mainly in the lactam form with the H on the N rather than on the S.

2694 541.133.1

A note on the diffusion of electrolytes in cells. HOUSEHOLDER, A. S., AND WILLIAMSON, R. R. *Bull. Math. Biophys.*, 45, *pp.* 73–76, *June*, 1942.—A simpler solution is given to the problem previously discussed. [Abstr. 2717 (1941)].

2695 541.133.1 : 541.134

The validity of the Ilkovič equation in the polarographic analysis of alkali metals and the characteristics of the alkali waves in various media. ZLOTOWSKI, I., AND KOLTHOFF, I. M. *J. Amer. Chem. Soc.*, 64, *pp.* 1297–1301, *June*, 1942.—Satisfactory agreement is found between the exp. determined diffusion currents of the alkali metals and the values calculated by means of the Ilkovič equation, provided that the initial drop time of the capillary $\geqslant 3$ sec. The equation of the alkali metal waves corresponds to the reversible reduction of a univalent ion. Half-wave potentials of K, Na and Li in water and in water-ethanol mixtures were determined and found to be const. within the conc. range investigated.

2696 541.134

The molal electrode potential of the silver–silver-chloride electrode in ethyl-alcohol–water mixtures. PATTERSON, A., WITH FELSING, W. A. *J. Amer. Chem. Soc.*, 64, *pp.* 1478–1480, *June*, 1942.—E.m.f. measurements were made on cells H_2(1 atm.), HCl(m in 10 and 20% $C_2H_5OH - H_2O$), AgCl(s) + Ag(s). V.p. and density measurements of the solvent were made and tabulated for the temperature range 0° through 40°.

2697 541.134 : 536.7

A thermodynamic study of the tin-bismuth system. SELTZ, H., AND DUNKERLEY, F. J. *J. Amer. Chem. Soc.*, 64, *pp.* 1392–1395, *June*, 1942.—The activities and rel. heat contents of Sn and Bi in their liquid alloys were determined from e.m.f. studies. The β solid solution at the eutectic has been calculated to contain 20% of Bi while the α solid solution contains 2·45% of Sn. [See Abstr. 3198 (1940)].

2698 541.134 : 541.124.7

The thermodynamics of bi-univalent electrolytes. VII. The activity coefficients of lead bromide from 5° to 40°. BATES, R. G. *J. Amer. Chem. Soc.*, 64, *pp.* 1136–1139, *May*, 1942.—E.m.f. measurements of the cell Pb-Hg (11%)/$PbBr_2$ (m)/AgBr-Ag have been made over the temperature range 5° to 40°. The molality of lead bromide was varied from 0·0015 to 0·018. The std. potentials of the cell are evaluated. Activity coeff. are calculated.

2699 541.134 : 541.132

The ionization constants of propionic acid in methyl- and ethyl-alcohol–water mixtures from 0° through 40°. PATTERSON, A., WITH FELSING, W. A. *J. Amer. Chem. Soc.*, 64, *pp.* 1480–1482, *June*, 1942.—E.m.f. measurements were made on cells of the type H_2(1 atm.), (HPr(m_1), NaPr(m_2), NaCl(m_3)) in x alcohol-water, AgCl(s) + Ag(s), where x is % methyl or ethyl alcohol (10 or 20). Values of the ionization const. of the propionic acid in 10 and 20% alcohol-water solutions were determined over the temperature range 0°–40°.

2700 541.134 : 541.132 : 541.8

The secondary ionization and activity coefficients of selenic acid. GELBACH, R. W., AND KING, G. B. *J. Amer. Chem. Soc.*, 64, *pp.* 1054–1057, *May*, 1942.—E.m.f.'s of cells, QH/H_2SeO_4, Ag_2SeO_4/Ag, have been measured at 25° in conc. of selenic acid ranging from 0·005 to 0·1 molar. A new method for determining E_o is presented. The secondary ionization const. for selenic acid has been approximated: 1×10^{-2}. The std. electrode potential, Ag/Ag_2SeO_4, $SeO_4^=$, has been determined: $E_o = -0{\cdot}8289$ V.

The solubility of silver selenate in water and in selenic acid solutions is given.

See Abstr. 2695 541.134 : 541.133.1

2701 541.134 : 541.135.5

The dropping-mercury electrode in acetic acid. I. Discontinuous current/voltage curves. BACHMAN, G. B., AND ASTLE, M. J. *J. Amer. Chem. Soc.*, 64, *pp.* 1303–1309, *June*, 1942.—The dropping Hg electrode has been applied to determinations of electroreducible substances in anhydrous acetic acid. Such substances with ½-wave reduction potentials betw. about $-0{\cdot}3$ and $-1{\cdot}4$ V may be determined normally, while other substances give discontinuous curves or are interfered with by the H ion curve and cannot be determined polarographically. Dissolved oxygen exerts a marked influence on current/voltage curves in acetic acid.

2702 541.134 : 541.135.5

The potential of the ytterbic-ytterbous ion electrode. LATTINEN, H. A. *J. Amer. Chem. Soc.*, 64, *pp.* 1133–1135, *May*, 1942.—The accepted value of the ytterbic-ytterbous ion electrode potential is criticized on the basis of chemical and electrochemical evidence. The ½-wave potential obtained with an ytterbium amalgam dropping into an ytterbic salt solution is $-1{\cdot}15$ V. This is suggested as the most probable value of the normal potential of the ytterbic-ytterbous ion electrode.

2703 541.134.4

A theory of electrical polarity in cells. I. WILLIAMSON, R. R., AND BLOCH, I. *Bull. Math. Biophys.*, 4, *pp.* 83–88, *June*, 1942.—In general, p.d.'s exist along the axis of a spherical cell containing an asymmetric diffusion field. The electrical potential is calculated for any point on the axis of such a cell, which is assumed to contain metabolite ions and charged colloidal particles.

See Abstr. 2701, 2702 541.135.5 : 541.134

See Abstr. 2612 541.136.1 : 536.775 : 537.221

See Abstr. 2613 541.136.24 : 536.775 : 537.322 : 537.221

2704 541.138.2

Oxidation of raw starch granules by electrolysis in alkaline sodium chloride solution. FARLEY, F. F., AND HIXON, R. M. *Industr. Engng Chem.*, 34, *pp.* 677–681, *June*, 1942.—Two phases of the oxidation of starch by halogens are investigated. One is a study of the mechanism of the oxidation of starch paste by bromine in neutral solution. The second phase presents an electrolytic process for oxidizing raw starch granules by alkaline NaOCl. The process is used to study the changes of raw starch during oxidation and to determine the effect of various factors upon the course of oxidation.

2705 541.138.3

The reduction of iodate and bromate in acid medium at the dropping-mercury electrode. ORLEMANN, E. F., AND KOLTHOFF, I. M. *J. Amer. Chem. Soc.*, 64, *pp.* 1044–1052, *May*, 1942.—In buffer solutions with a *p*H between 1 and 5·5 the equation of the wave obtained in the reduction of iodate is given by the expression: $\pi = 0{\cdot}06 - 0{\cdot}12\ p\mathrm{H} + 0{\cdot}12 \log\ (i_d - i)/i$. A similar expression between *p*H of 1 and 3 was found for the bromate wave. In dilute solutions of strong acids 2 waves are obtained with iodate and bromate when the H-ion conc. is $< 2{\cdot}0 \times$ the conc. of iodate or $2{\cdot}3 \times$ the conc. of bromate. The diffusion current of the first wave is = that of the H wave at the same H-ion conc. The ½-wave potentials of iodate and bromate vary with a change in drop time, but are independent of the iodate and bromate conc.

2706 541.18 : 532.1

The rheology of the blood. II. The effect of fibrinogen on the fluidity of blood plasma. BINGHAM, E. C., AND ROEPKE, R. R. *J. Amer. Chem. Soc.*, 64, *pp.* 1204–1206, *June*, 1942.—The fluidity/conc. relationship of solutions of blood fibrinogen prepared from ox plasma was found to be linear up to a conc. of 1·0%.

2707 541.18.02

The colloidal state of spinnable solutions. ERBRING, H. *Kolloid Z.*, 98, *pp.* 164–170, *Feb.*, 1942.—In the course of changes like coagulation or gel formation of certain substances, a state is reached in which fibrous molecules are observable or threads easily deformable by tensile or compressive forces. These properties are necessary for making the substance spinnable. Curves are given showing the behaviour of the respective viscous solutions. R. N.

2708 541.182.02

Water-soluble cellulose. LIESER, T. *Kolloid Z.*, 98, *pp.* 143–148, *Feb.*, 1942.—Cellulose dissolved in a macromolecular organic base was converted into the tri-tetraethyl-ammonium-tri-xanthogenate. This cellulose derivative, dissolved in water in the ratio of about 1 : 1 000, was dialysed against pure water until all the xanthogenate groups and the organic bases were removed by hydrolysis and saponification. Thus there remained a kind of aq. solution of cellulose. The process is explained by the cellulose consisting of complex giant molecules in which chains of glucose anhydrides formed by the main valency forces are interconnected by the covalency forces of hydroxyls. These covalency forces appear to be overcome by hydration in this kind of aq. solution. R. N.

2709 541.182.043 = 3

Further contributions to the knowledge of Congo-rubin. HALLER, R. *Kolloid Z.*, 94, *pp.* 199–203, *Feb.*, 1941.—By the chromatographic method applied betw. 70° and 80°C. it is shown that a solution of Congo-rubin is a system of 2 dispersed phases of different degrees of dispersion. The phases may be separated so that the filtrate contains the highly dispersed phase which is stable against electrolytes. The adsorbed phase of low dispersity is labile. An addition of electrolyte causes colour change and precipitation. R. N.

2710 541.182.4 = 3

Constitution of diluted soap solutions. IV. Activity of hydroxyl ions of the sodium laurate solutions at 20°. EKWALL, P., AND LINDBLAD, L. G. *Kolloid Z.*, 94, *pp.* 42–57, *Jan.*, 1941.—To prove the theory previously published [Abstr. 906 (1941)] the dependence of the activity of hydroxyl ions and of the degree of hydrolysis on concentration was determined for several soap solutions. The results obtained with sodium laurate are given. Activity was measured with a glass

electrode in the form of a tube. The experiments confirm the assumption of gradual association. R. N.

2711 541.182.5

Starch studies. MULLEN II, J. W., AND PACSU, E. *Industr. Engng Chem.*, 34, *pp.* 807–812, *July*, 1942.—Gelatinization of potato, tapioca, wheat, corn and rice starch was studied in water-pyridine mixtures of conc. ranging from pure water to pure pyridine. The gelatinization of these starches was followed by consistometric methods furnishing data relative to the temperatures, consistencies and heats, involved in the process. Correlation was established between these factors and the granule sizes of the different starch species. The disaggregation of the starch granules appears to reach a more advanced stage in a mixture containing 30% pyridine than in any other conc. The heat absorbed during gelatinization is more than ample to furnish energy for breaking 1 to 2 H bonds per glucose anhydride unit.

See Abstr. 2680 541.182.6 : 541.124.7

2712 541.182.63

Ionic competition in base-exchange reactions. BRAY, R. H. *J. Amer. Chem. Soc.*, 64, *pp.* 954–963, *April*, 1942.—The immediate equilibria between mixtures of exchangeable cations as they occur naturally in clays and small amounts of an added cation have been studied. Cation-exchange equations have been developed from the data obtained. The exchangeable bases as usually determined by leaching with a neutral salt solution are shown to be those which are in equilibrium with added electrolytes after a short shaking period and are defined as readily exchangeable bases.

2713 541.183

Degrees of freedom in multicomponent absorption and rectification columns. GILLILAND, E. R., AND REED, C. E. *Industr. Engng Chem.*, 34, *pp.* 551–557, *May*, 1942.—A general analysis of multicomponent interphase contacting systems is presented to illustrate the restrictions and limitations inherent in any method of rectifier, absorber or extractor process design.

See Abstr. 2534 541.183.2 : 531.724

2714 541.183.24

Application of the Gibbs adsorption equation to solutions of colloidal electrolytes. ALEXANDER, A. E. *Trans. Faraday Soc.*, 38, *pp.* 248–254, *June–July*, 1942.—Application of the Gibbs fundamental equation to solutions of colloidal electrolytes, e.g. paraffin-chain salts and dyestuffs, leads to the apparent paradox of predicting zero or negative surface excess of solute in a region where the surface tension has been considerably lowered, and where experiment shows strong positive absorption. Recent explanations involving correcting terms for surface orientation and submerged double layer, or assuming a particular mol. structure for the adsorbed layer, are shown to be untenable. Application of Gibbs equations to solutions containing both single molecules and micelles shows that at min. surface tension the total adsorption is not necessarily zero since the vanishing of $d\gamma/dC$ may equally well be due to the conc. of single molecules becoming independent of C, the stoichiometric concentration. This explanation accords with experiment and with the law of mass action applied to the single molecule/micelle equilibrium. A number of still unexplained results with dyestuff solutions and certain non-aqueous systems are discussed. N. M. B.

2715 541.183.26

Activated carbon from hydrocarbons and chlorine. STRATTON, G. W., AND WINKLER, D. E. *Industr. Engng Chem.*, 34, *pp.* 603–606, *May*, 1942.—The carbon is produced by burning hydrocarbons and Cl and is activated by heating at 1 000°C. for 90 min. It is superior to other activated carbons, as shown by adsorption isotherms and gas adsorption measurements.

2716 541.183.26

Coconut shell charcoal. TS'AI LIU-SHENG AND CHUANG KUNG-YAO. *Industr. Engng Chem.*, 34, *pp.* 812–813, *July*, 1942.—The effect of conc. of $ZnCl_2$ and of HCl on the activity of coconut shell charcoal was studied by varying each separately. In the case of HCl the activity increases at first rapidly and then very slowly with increasing conc. In the case of $ZnCl_2$ the activity increases and rapidly reaches a max. In general, the results favour the dissolution theory of activation, in which it is assumed that complex ions are formed which cause the cellulose to be dissolved.

See Abstr. 2535 541.183.26 : 531.724

2717 541.2 = 4

Classification of atomic masses. III–IV. JAQUEROD, A. *Helv. Phys. Acta*, 15, 2, *pp.* 192–198, *and* 15, 3, *pp.* 259–265, 1942. [See Abstr. 1664 (1942)].

See Abstr. 2552 541.25 : 534.22

See Abstr. 2671 541.26 : 539.433

See Abstr. 2574 541.57 : 535.375.5

2718 541.6 : 535.32

Specific dispersion of pure hydrocarbons. THORPE, R. E., AND LARSEN, R. G. *Industr. Engng Chem.*, 34, *pp.* 853–863, *July*, 1942.—Sp. dispersions for a large number and variety of pure hydrocarbons, obtained from the literature and from additional measurements, are analysed with the object of correlating dispersion with mol. structure. It is possible to calculate the sp. dispersion of a hydrocarbon from the number of saturated C atoms present and the number of C atoms associated with double bonds. The presence of conjugation, not confined within a single ring, produces an exaltation of the sp. dispersion. The effect may be anticipated by a consideration of the double-bond formula. The method of calculation may be used to obtain information on structure.

2719 541.6 : 537.533.73

The structures of nitrous oxide and hydrogen azide. SCHOMAKER, V., AND SPURR R. *J. Amer. Chem. Soc.*, 64, *pp.* 1184–1187, *May*, 1942.—The structures were investigated by the electron diffraction method. [See Abstr. 1178 (1940)].

2720 541.6 : 537.533.73

The structure of methylenecyclobutane and hexamethylethane. BAUER, S. H., AND BEACH, J. Y. *J. Amer. Chem. Soc.*, 64, *pp.* 1142–1147, *May*, 1942.—In methylenecyclobutane the C atoms are coplanar, 4 of them situated on the average at the corners of a

square, the 5th on an extension of one of the diagonals. For hexamethylethane the theoretical intensity curves for free rotation, and for the eclipsed and staggered configurations, differ by very little, yet agreement with observation is slightly better for the staggered model.

See Abstr. 2651 541.6 : 539.172.4

See Abstr. 2665 541.6 : 539.26

2721 541.61

Structure and reactivity of cellulose. ULMANN, M. *Kolloid Z.*, 98, *pp.* 160–164, *Feb.*, 1942.

2722 541.62

Conjugated diolefins by double-bond displacement. HENNE, A. L., AND TURK, A. *J. Amer. Chem. Soc.*, 64, *pp.* 826–828, *April*, 1942.—The diolefins dimethallyl and diallyl were first studied to determine various sets of conditions which would promote isomerization, and to establish a std. procedure for use with other hydrocarbons. After this a series of 1,5-diolefins was subjected to catalytic alumina treatment, and the products were separated, studied and identified. The characteristics of the isomerization reaction are discussed.

2723 541.621 : 539.152.1 = 3

The problem of isomerism in nuclear physics. FLÜGGE, S. *Phys. Z.*, 42, 13–14, *pp.* 221–254, *Sept.*, 1941.—A comprehensive report on nuclear isomerism. Part I deals with the discovery of isomerism, the formulation of the problem, the rotation impulse theory, isomerism as γ-activity, and other methods of explaining isomerism (spin conservation rule, stereo-isomerism, the Sachs model and the drop model). Part II contains the experimental material and its quantitative evaluation embodied in a table which includes data on the activation of the metastable state and half-value period, internal conversion and theoretical half-value periods for ^{13}C, ^{69}Zn, $^{79\cdot81}$Se, ^{80}Br, ^{83}Kr, ^{85}Sr, ^{87}Y, ^{93}Nb, ^{104}Rh, $^{107\cdot109}$Ag, ^{113}In, ^{114}In, Pb. There are 98 references in the bibliography. H. G. S.

2724 541.623

The tautomeric character of the imidazole ring. GREEN, H., AND DAY, A. R. *J. Amer. Chem. Soc.*, 64, *pp.* 1167–1173, *May*, 1942.—The monoacyl derivatives have been shown to be the probable intermediates in the formation of the tolimidazoles from 3,4-diaminotoluene and organic acids. Tautomerism of the imidazoles cannot be explained by any one theory alone and it is possible that it involves both prototropy and electromerism depending upon the conditions. Changing the radical in position 2 from a methyl to a phenyl group has no apparent immobilizing effect upon the orientation of the imidazole ring relative to the aromatic nucleus.

2725 541.64 = 3

On systematics of mixed polymers. JENCKEL, E. *Z. phys. Chem. A*, 190, *pp.* 24–42, *Nov.*, 1941.—From kinetic considerations 3 boundary cases are distinguished when 2 monomeric substances are jointly polymerized, viz. the polymeric mixture, the regularly mixed polymer and the irregularly mixed polymer. Their formation depends on the values of the velocity const. for the chain-growth of the monomeric and polymeric substances, respectively. R. N.

2726 541.64 : 539.89 = 3

On the influence of the milling process on the properties of highly polymerized substances (cellulose and polystyrol) and on the nature of its effect. HESS, K., STEURER, E., AND FROMM, H. *Kolloid Z.*, 98, *pp.* 148–159, *Feb.*, 1942.—The question of chemical effects achieved by the mechanical process of milling is discussed. Some properties of the polymers are materially changed; and a systematic investigation was carried out on size and shape of the particles, electron-microscopic appearance, X-ray structure, adsorbability, reaction kinetics, swelling, solubility and viscosity. R. N.

See Abstr. 2688 541.64 : 541.128

See Abstr. 2691 541.64 : 541.128.1

2727 541.64 : 541.128.4

Studies in gaseous hydrogenation and polymerization reactions. BURNHAM, H. D., AND PEASE, R. N. *J. Amer. Chem. Soc.*, 64, *pp.* 1404–1410, *June*, 1942.—The polymerization reactions of ethylene and of acetylene and the hydrogenation reaction of ethylene are inhibited by small initial additions of NO. The results have been interpreted as indicating a chain mechanism for the above reactions, and that the NO acts by combining with the free radicals or atoms and effectively prevents their further participation in the chain reaction. The reactions of propylene are not inhibited by NO.

See Abstr. 2564 541.651.22 : 535.342

See Abstr. 2615 541.67 : 537.226.2

2728 541.68

The reactivity of the cystine linkage in keratin fibres. I. The action of alkalis. II. The action of reducing agents. STOVES, J. L. *Trans. Faraday Soc.*, 38, *pp.* 254–267, *June–July*, 1942.—The first reaction to occur in keratin fibres treated with alkalis is hydrolysis of the cystine linkage. Subsequent decomposition of the sulphenic acid so formed leads to secondary reactions giving rise to the formation of new bonds between the peptide chains. The final result obtained on treating animal fibres with alkalis is determined by the extent to which these various reactions have taken place. Changes in physicochemical properties have been used to examine the action of various reducing agents upon the cystine linkage of keratin fibres.

See Abstr. 2540 541.68 : 532.14 : 532.612

2729 541.8

Hydrocarbon-water solubilities at elevated temperatures and pressures. GRISWOLD, J., AND KASCH, J. E. *Industr. Engng Chem.*, 34, *pp.* 804–806, *July*, 1942.—Solubilities of water in 3 petroleum fractions have been determined up to 280°C. and 940 lb./in.^{2} abs. at the total pressure of the systems. The results (expressed on a mole basis) indicate that the solubility of water in straight-run petroleum fractions is substantially independent of mol. wt. of the oil. This observation permits a correlation of water dissolved in petroleum fractions in terms of steam pressure and temperature.

See Abstr. 2518 541.8 : 518.3

See Abstr. 2657 541.8 : 539.214

See Abstr. 2700 541.8 : 541.132 : 541.134

2730 542.8

Construction and operation of a polarograph. FURMAN, N. H., BRICKER, C. E., AND WHITESELL, E. B. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 333–340, *April* 15, 1942.—The Nejedly model of the Heyrovský–Shitka polarograph is described with full constructional details. It is particularly applicable to the plotting of curves manually. E. H. W. B.

2731 545.37

Potentiometric titrations. FURMAN, N. H. *Industr. Engng Chem.* (*Analyt. Edit.*), 14, *pp.* 367–382, *May* 15, 1942.—A review with a bibliography of 630 references.

CRYSTALLOGRAPHY

See Abstr. 2628	548 : 535.3 : 537.531
See Abstr. 2575	548 : 535.413
See Abstr. 2618	548 : 536.21 : 537.312.8
See Abstr. 2584	548 : 536.421
See Abstr. 2591	548 : 536.63
See Abstr. 2619, 2620	548 : 538.639 : 537.32
See Abstr. 2655	548 : 539.185

2732 548.73

Structures of complex fluorides. Potassium oxyhexafluocolumbate, K_3CbOF_6. WILLIAMS, M. B., AND HOARD, J. L. *J. Amer. Chem. Soc.*, 64, *pp.* 1139–1141, *May*, 1942.—[See Abstr. 42 (1939)]. X-ray photographs of crystalline K_3CbOF_6 show cubic holohedral symmetry, and indicate a face-centred unit of structure with $a = 8{\cdot}87$ Å containing 4 stoichiometric molecules. As in the case of the heptafluozirconates, K_3ZrF_7 and $(NH_4)_3ZrF_7$, these data are incompatible with the usual rigorous application of the theory of space-groups, and it is necessary to assume that they are statistical results for a structure in which there is some randomness in the atomic arrangement.

2733 548.73

Effects of heat, solvents and hydrogen-bonding agents on the crystallinity of cellulose esters. BAKER, W. O., FULLER, C. S., AND PAPE, N. R. *J. Amer. Chem. Soc.*, 65, *pp.* 776–782, *April*, 1942.—Cellulose triacetate, acetate-butyrate and tributyrate, are examined by X-rays after treatment by heat, solvent vapours and water. The changes in crystallinity and orientation induced have a direct-bearing on the question of whether linear macromolecules are extended or kinked in the unoriented crystalline state, since crystalline arrays of molecules are produced which have approx. the same degree of extension as in the liquid. J. T.

2734 548.73

The crystal structure of hydrazinium difluoride. KRONBERG, M. L., AND HARKER, D. *J. Chem. Phys.*, 10, *pp.* 309–317, *June*, 1942.—X-ray analysis shows that crystalline $N_2H_6F_2$ is built upon a rhombohedral unit cell having $a_0 = 5{\cdot}43$ Å, $\alpha = 38° 10'$, containing 1 molecular formula. The positions of the atoms correspond to *trans*- ions which form linear H bonds to H_2F_2 ions at the corners of an elongated octahedron. Each H_2F_2 ion forms 3 H bonds to different NH_2 ions, and condenses the octahedra into continuous layers. As a result each N atom comes in contact with an extra H_2F_2 ion and thereby assumes a co-ordination number of 5. Analysis of the N–N and N–H . . . F distances of 1·42 Å and 2·62 Å, respectively, shows that each atom in the NH_2 ion bears approx. $\frac{1}{4}$ of a unit pos. charge. The bearing of the structure of the ion on the adjacent-charge rule is discussed. Some of the properties of the ion are interpreted in terms of the structure.

2735 548.73 = 3

X-ray Fourier synthesis of metallic magnesium. BRILL, R., HERMANN, C., AND PETERS, C. *Ann. Phys., Lpz.*, 41, 1, *pp.* 37–53, 1942.—In continuation of work on the connection between electron distribution and chemical linking [Abstr. 1861 (1939)] the authors give a detailed description of their investigation with metallic Mg and the results obtained. The synthesis is carried out in 2 ways—(1) with interpolated F values; (2) with intensity values measured with monochromatic radiation and corrected for temperature. It is pointed out that about 1·75 electrons per Mg atom are uniformly spread over the whole lattice, and, in addition, there is in the lattice a distinct point where electrons are concentrated, and in its vicinity points with electron deficit. H. G. S.

See Abstr. 2520 548.73 : 518.5

2736 548.74

The observation of crystalline reflections in electron microscope images. HILLIER, J., AND BAKER, R. F. *Phys. Rev.*, 61, *pp.* 722–723, *June* 1 *and* 15, 1942.

GEOPHYSICS

2737 550.312

Deflections of the vertical in the United States (1927 datum). DUERKSEN, J. A. *Spec. Publ. U.S. Cst Geod. Surv., No.* 229, [16 *pp.*], 1941.—Deflections of the vertical are tabulated and mapped for all latitude and longitude stations of first- and second-order accuracy in the U.S. for which the geodetic positions are now available on the N. American datum of 1927, based on the Clarke spheroid of 1866. The list contains 654 deflections in the meridian and 462 in the prime vertical. A. HU.

2738 550.341

A chronologic conspectus of seismologic stations. WOOD, H. O. *Bull. Seism. Soc. Amer.*, 32, *pp.* 97–159, *April*, 1942.

2739 550.341

Macroseismic study of the New Hampshire earthquakes of December, 1940. DEVLIN, J. J., LANGGUTH, L. C., AND ARRINGDALE, R. L. *Bull. Seism. Soc. Amer.*, 32, *pp.* 67–73, *April*, 1942.

2740 550.341

Instrumental study of the New Hampshire earthquakes of December, 1940. LEET, L. D., AND LINEHAN, D. *Bull. Seism. Soc. Amer.*, 32, *pp.* 75–82, *April*, 1942.—A study of original records and bulletin readings for 2 strong earthquakes in the Ossipee Mountains district gave for both $\phi = 43° 50'$ N., $\lambda = 71° 17'$ W. *S* started from a depth of approx. 35 km., and *P* at the same time from a depth of 15 km. The second shock was multiple. First motion from the second earthquake was reversed from that of the first at nearby stations. No foreshocks preceded the first earthquake; there was a small one just before the second and there were only

10 after-shocks, the last one occurring on February 12, 1941.

2741 550.346

Seismic effects of quarry blasting. THOENEN, J. R., AND WINDES, S. L. *Bull. U.S. Bur. Min., No.* 442, [83 *pp.*], 1942.—Data were collected from records of many tests conducted at 28 stone quarries, in a limestone mine, and in 20 residential structures of various types. A large range of explosive charges and of distances from shot points to seismometer stations was used, while transmission media varied from granite to gravel beds. (1) The seismic vibrations for normal quarry practice produced displacements no greater than those for normal living activities within the structure, or ordinary traffic conditions outside, (2) the magnitude of seismic displacement caused by quarry blasts can be predicted for given conditions, (3) unconsolidated or abnormally thick overburden causes greater displacement at lower frequency than solid rock for given distance and explosive charge, (4) the susceptibility to vibration for buildings of 1, 2, or 3 stories can be determined, (5) damping inherent in a building restrains the effect of resonant vibration, (6) for the range of tests an acceleration equal to g is a practical index of damage, but in ordinary quarry practice accelerations of about $0{\cdot}01g$ occur, while in tests carried to damage point, damage occurred only when the acceleration $\geqslant g$.

R. S. R.

See Abstr. 2632 550.38 : 537.591

2742 550.385 : 551.510.535

Holes in the ionosphere and magnetic storms. ECKERSLEY, T. L. *Nature, Lond.*, 150, *p.* 177, *Aug.* 8, 1942.

See Abstr. 2668 551 : 539.374

See Abstr. 2742 551.510.535 : 550.385

2743 551.513.1

The energy equation for a viscous compressible fluid. STEWART, H. J. *Proc. Nat. Acad. Sci., Wash.*, 28, *pp.* 161–164, *May*, 1942.—It is shown that previous derivations of the energy equation for a viscous compressible fluid are in error through the omission of terms involving the viscous stresses. The equation is redeveloped and the correctness of the new form demonstrated. A. HU.

2744 551.515

Comments on T. E. W. Schumann's paper, "An investigation concerning G. I. Taylor's correlation coefficient of turbulence." PEKERIS, C. L. *Phil. Mag.*, 33, *pp.* 541–543, *July*, 1942.—The author shows that functions which have an exponential auto-correlation coeff. of the type obtained by Schumann [see Abstr. 666 (1942)] are not of general application: they have no derivative, and the attempt to develop their correlation coeff. in the form given by Taylor breaks down because the coefficients diverge. Wherever the coeff. are finite, Taylor's original form holds. A physical example is given of a natural process in which the auto-correlation coeff. is of Taylor's form. A. HU.

2745 551.582

Indications as to climatic changes from the timber line of Mount Washington. GRIGGS, R. F. *Science*, 95, *pp.* 515–519, *May* 22, 1942.—Reference is made to the statements by Gray concerning the distribution of related species in historical times and the variation in distribution with climate for N.E. America. The movement of the trees into the tundra in Alaska and their change of form with altitude indicates a climate becoming more temperate. At Mt. Washington the reverse is shown, with the root growth along fallen tree trunks, the killing of vertical shoots, and smaller size of the trees. These less hospitable conditions are confirmed by other evidence. The theory of alternative continental glaciation is favoured and this shift of the centre of glaciation is shown by timber lines.

R. S. R.

2746 551.7

Geology of the central area of the Ossipee Mountains, New Hampshire, earthquakes. BILLINGS, M. P. *Bull. Seism. Soc. Amer.*, 32, *pp.* 83–96, *April*, 1942.

VARIOUS SUBJECTS

See Abstr. 2539 576.35 : 532.6/7

See Abstr. 2515 624.13 : 517.947

See Abstr. 2516 624.13 : 517.947.43

See Abstr. 2595 662.61 : 536.633

See Abstr. 2670 677 : 539.431.6

See Abstr. 2580 681.4.02 : 535.81

See Abstr. 2630 77 : 537.533.79

See Abstr. 2658 77 : 539.215.2

2747 771.53

Temperature and interrupted photographic exposure. BLAIR, J. M. *J. Opt. Soc. Amer.*, 32, *pp.* 332–333, *June*, 1942.

See Abstr. 2566 771.53 : 535.349

See Abstr. 2579 771.54 : 535.7 : 621.397.6

See Abstr. 2636 9 : 538 : 621.318